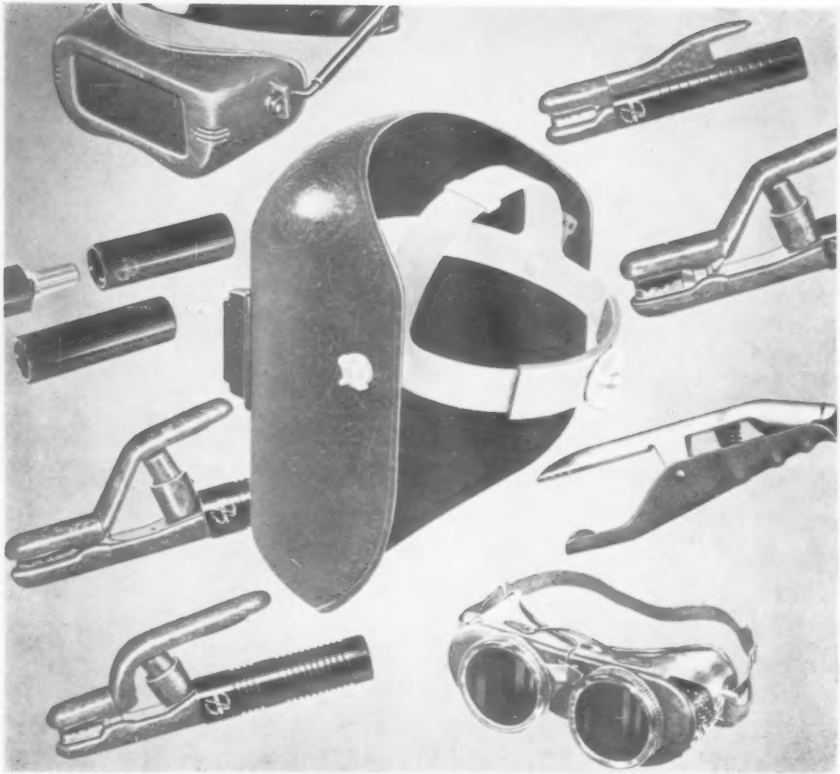
INDUSTRY & WELDING

DECEMBER 1956

Mechanize Your Welding, too!

...see page 44

More than 40,000 important welding men in engineering, production and maintenance are reading this issue



Insist on the BEST . . . for ECONOMY

This curved-shell helmet, type H1-AP, with its nylon Adjust-O-Lok headgear and plastic lens holder is one of 18 models. *Nylon*, used for headband and friction pivots, and for the large winged knob adjusting mechanisms, makes working parts last and is completely insulative.

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Jackson Supergoggles are shown at lower right. They're wider, without being bulky, to be worn over today's larger prescription glasses and safety spectacles. Available, with elastic headband or plastic headrest, for *gas welding*, or, with clear hardened lenses, for *chipping* and *grinding*.

Electrode Holders, Ground Clamps and Cable Connectors are long-time favorites with most weldors. However, it pays to renew the acquaintance, and check up on the latest improvements in the line. For progress never stops at Jackson's.

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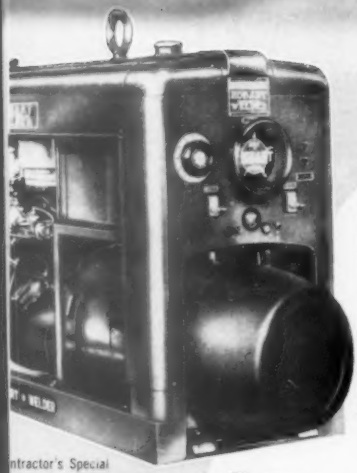

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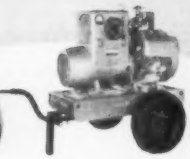
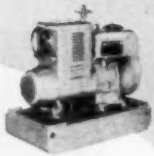


AC Welder/AC Power



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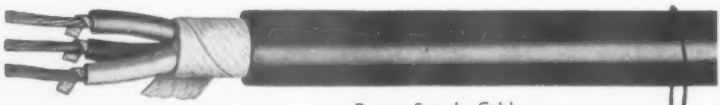

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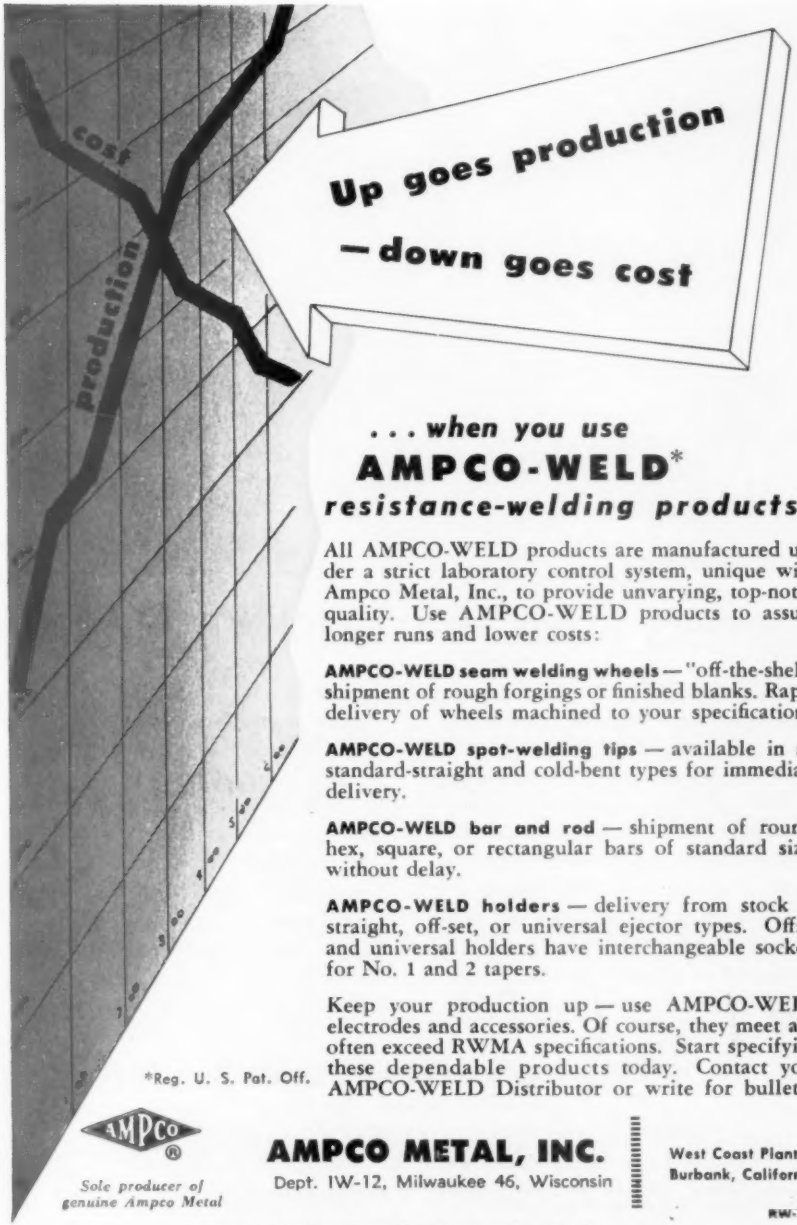

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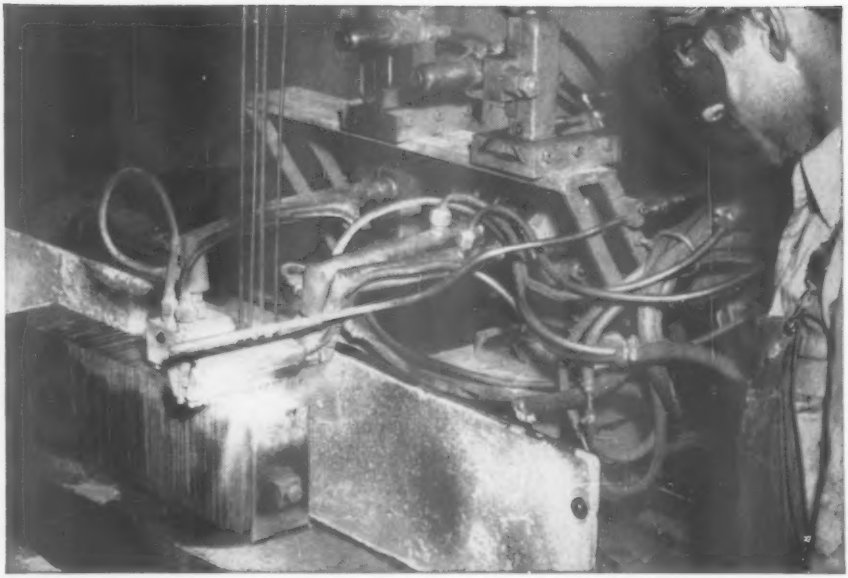

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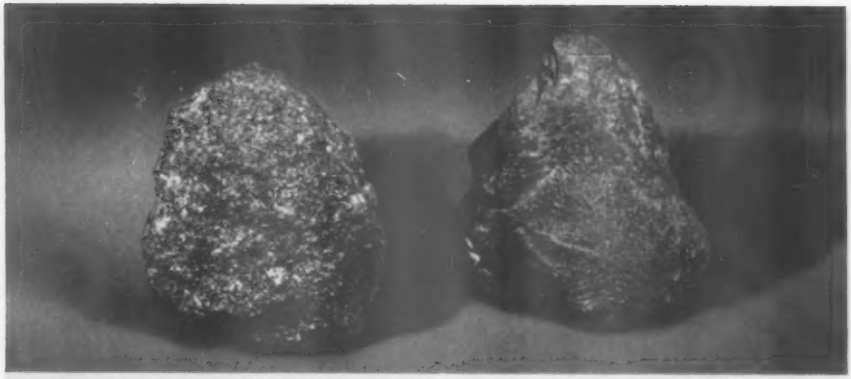

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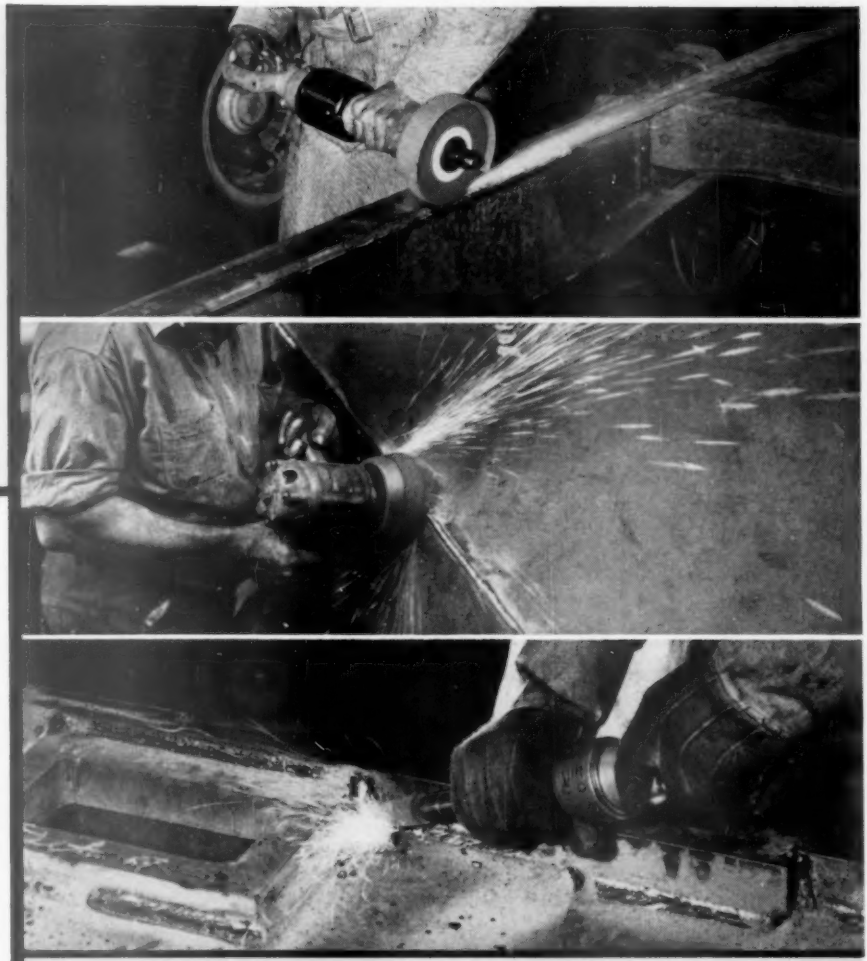

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LETTERS TO THE EDITOR

Self-Sticking Markers

Gentlemen:

In your June, 1956 issue of INDUSTRY & WELDING, there appeared an article relative to the "Brady Self-Sticking Markers," we would appreciate receiving samples of this product and information relative to their distributors in San Diego or Los Angeles.

J. N. Willits, Mfg. Eng.,
Machine Planning Dept.
Ryan Aeronautical Company

This inquiry has been passed on to the W. H. Brady Co.

Welding School Intrigued

Gentlemen:

Your article in the September issue 1956 on the high frequency oscillator superimposed on the D. C. current is intriguing. If available, we would like further information on this H.F. unit.

C. B. Leahy, Welding Division
John A. O'Connell Vocational High School and Technical Institute

Information has been sent.

Promotes Welding to Replace Bolts

Gentlemen:

I acknowledge with thanks receipt of Industry & Welding, July 1956 issue, which you sent me containing the article on the quiet, efficient and economical use of welding.

The handling of this article is commendable and should help the promotion of welding as opposed to high-tension bolts. I think the

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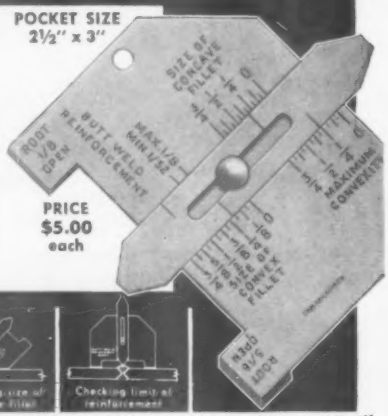

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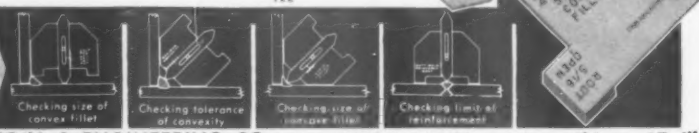
Checking size of convex fillet
Checking tolerance of convexity
Checking size of concave fillet
Checking limit of reinforcement

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LETTERS TO THE EDITOR . . .

(Continued from Page 12)

cover work playing up this particular work is also very well done.

Van Rensselaer P. Saxe
Engineer

Thanks for the nice words, Mr. Saxe, we never miss an opportunity to promote welding.

Paper on Positioning

Gentlemen:

We will appreciate having you assist us in obtaining a copy of the original paper by W. J. Vernon on "Positioning for Automatic Welding," in your February issue.

John Mikulak
Assistant to the Vice-President
Manufacturing
Worthington Corporation

Mr. Mikulak was given information as to where this material could be obtained.

Wants Automatic Flame Cutting Equipment

Gentlemen:

We are interested in knowing what companies manufacture automatic flame cutting equipment, particularly the equipment used in automatic milling or pattern cutting operations.

If it is feasible for you to do so would you be kind enough to send us a list of such manufacturers.

Frank Holloway, Product
Development

General Chemical Div., Allied
Chemical & Dye Corp.

We are always glad to supply information on welding and cutting equipment sources.

Hates to Miss an Issue

Gentlemen:

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in *One* Downstroke of Press!

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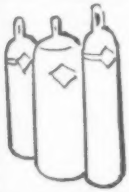

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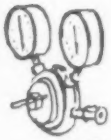

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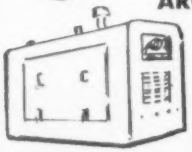
ARC WELDING EQUIPMENT ✓



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Youngstown, Ohio and Los Angeles, California
BRANCHES: Akron, Cincinnati, Columbus, Ohio

And because Burdox has them ALL, you make the most of your time and money. The opportunity to choose the least costly, highest quality and most adaptable process or product is yours when you call BURDOX, since BURDOX has the *right* equipment for *every* job. When you have a welding job to be done, you are confronted with the questions of HOW to use WHAT product WHEN . . . a call to BURDOX gives you the answers. BURDOX engineers are expert welding men who will give you the benefit of their years of experience. Write for your FREE catalogue NOW!

LETTERS TO THE EDITOR . . .

(Continued from Page 14)

missing the May, 1956 issue of INDUSTRY & WELDING.

I have maintained a complete collection of your magazine since 1940 and I value this collection very highly as a reference source. Would you please send the missing issue to the new address—I'd hate to be without it.

Sol H. Mandell
Precision Welding Co.

Many of our readers learn to depend on the informative articles run in INDUSTRY and WELDING.

Welding Magnesium

Gentlemen:

Thank you very much for your copies of the June and July issues of Industry & Welding.

I would appreciate receiving the May 1956 issue. We are particularly interested in the articles on welding of magnesium and your publication will be of value to us in our evaluations.

A. J. Rosenberg, Aircraft
Accessory Turbine Dept.
General Electric Company.

The May issue has been sent to Mr. Rosenberg.

Ceramic Jigs for Brazing

Gentlemen:

In your "Letters to the Editor" column in the August issue, reference was made to "Ceramic Jugs for Brazing." We have recently encountered a brazing problem in an experimental induction heating set up where a ceramic holding fixture may be the answer.

Not having seen the March issue of your magazine in which this process was featured, I would appreciate any information you have relative to ceramic fixtures.

Victor T. Czebatol, Process Engr.
Rochester Products Div. of
General Motors

Tear sheets have been sent.

Alloys and Fluxes for SOLDERING FILLING SEALING ARC WELDING TORCH WELDING FURNACE BRAZING TORCH BRAZING

YOUR A-S DISTRIBUTOR HAS NO. 11

SWITCH TO ALL-STATE NO. 11

Eliminated 5 Separate Soldering Operations

Nickel Silver replaced Silver Solder Gave better job — Lowered costs

The manufacturer of a famous one-man chain saw, developed standardized jigs, fluxing procedures and operational techniques enabling the substitution of All-State No. 11 Nickel Silver for more expensive silver solder in fabricating a critically stressed handle-bar unit. Record lows in cracking and breakage of brazed joints accompanied the consequent reduction of fabrication costs.**

ALL-STATE No. 11 is Versatile

- Brazes any combination of 14 metals.
- Saves on before and after brazing costs.
- Saves time. Yields 70-80,000 psi Tensile; 120-160,000 psi Shear.

10 lb. No. 11 should be enough to convince you. Comes bare or flux coated.

FREE Ask for Steel Folder

**Details on request

ALL-STATE WELDING ALLOYS CO., INC., WHITE PLAINS, N. Y.

Circle No. 5 on Reader Service Card.

STAINLESS STEEL WELDING WIRE...

Spooled . . . layer wound to assure a smooth, even feed. Sizes: .035", .045", 1/16", 5/64" and 3/32" diameters.

Coiled . . . layer wound on rims for submerged arc welding. Sizes: 1/16", 5/64", 3/32", 1/8", 5/32", 3/16" and 1/4" diameters.

Cut Lengths . . . straightened and cut wire furnished in 36" lengths for inert arc and gas welding. Sizes: .035", .045", 1/16"; 5/64", 3/32", 1/8", 5/32", 3/16" and 1/4" diameters.

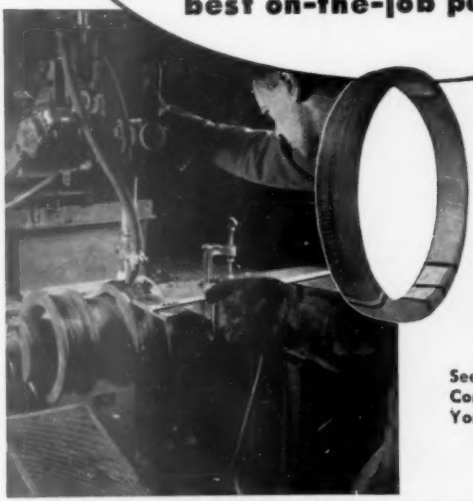
Two factors give

Drawalloy

CORPORATION

WELDING WIRE

best on-the-job performance



Drawalloy welding wire is a product of two factors—years of experience in the welding industry combined with the best wire mill drawing practices. The result is clean welding wire with the proper finish, temper, diameter tolerance and chemical analysis. It's a wire that produces the highest quality welds continuously—with an easy, sure feed and a constant, smooth arc.

See your distributor or write Drawalloy Corporation, Lincoln Highway at Alloy St., York 11, Pennsylvania

WEAR-O-MATIC HARD-FACING WIRE...

Coiled . . . precision drawn for perfect roundness to insure continuous, smooth feed with any automatic head. Available in six Types for hard-facing applications.

Drawalloy
CORPORATION
The Wire Mill For The Welding Industry

YORK 11, PENNSYLVANIA

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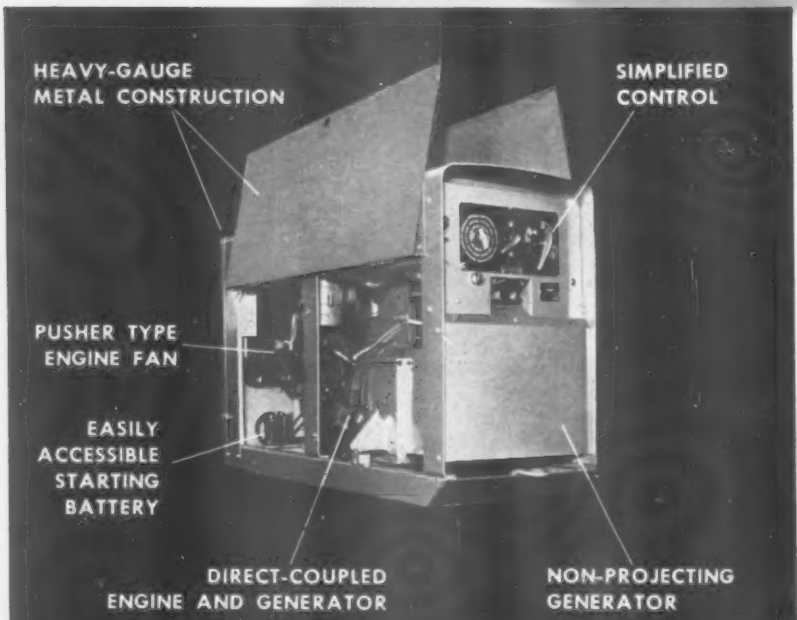


Now—available in 200-, 300-, 400-amp models

EASILY PRESET Electrode Selector, Current Dial—Dual controls make current setting easier, more accurate—no guesswork.

CONSTANT-PRESSURE Brush Springs — Right pressure maintained for life of generator brushes without adjustments.

PRELUBRICATED Generator Bearings — Ball bearings prelubricated with sufficient grease for years of service—no relubrication.

G.E.	✓	✓	✓	
MFR. A			✓	
MFR. B				

How General Electric's NEW line of engine-driven welders helps you save with faster welding

ADVANCED DESIGN ASSURES LESS "DOWNTIME," AND MINIMUM MAINTENANCE—FOR FASTER, LOWER-COST WELDING

Nothing stretches out welding time more than unreliable equipment. It increases your maintenance costs and results in non-productive "downtime."

TO REDUCE DELAYS, General Electric's new line of engine-driven welders has been designed and field-tested for maximum durability and minimum maintenance—without sacrifice in performance. These new 200-, 300-, and 400-amp welders:

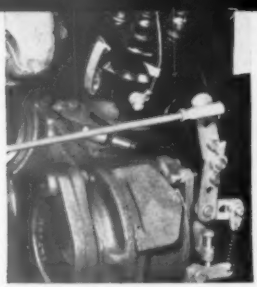
SAVE YOU TIME—Sturdy construction, the dependable Hercules engine, new-design generator, and simplified control all combine to give you steady output, longer operating time between overhauls, and reduced maintenance.

SAVE YOU MONEY—General Electric engine-driven welders begin saving you money the first day on the job. For example, the deep-sump crankcase provides complete lubrication to all moving engine parts—up to a 15-degree tilt in any direction. This helps to reduce costly breakdowns. Additional G-E advantages are described below.

FOR MORE INFORMATION contact your nearby General Electric Welding Distributor (listed in the yellow pages of your telephone book) or write Section 714-5E, General Electric Company, Schenectady 5, N. Y.

Progress Is Our Most Important Product

GENERAL ELECTRIC



DEPENDABLE Geared Governor—Gear-driven governor maintains close speed regulation for best welding, without lubrication.

PUSHER-TYPE Engine Fan—Large diameter pusher-type fan circulates ample cooling air for engine and generator—no vapor-lock.

CONTROLLED CURRENT PEAKS—Current peaks are controlled. Arc can be crowded with no time-consuming "stumbling" or "freezing."

Crucible Stainless Automatic Welding Wire

for *cleaner, faster, sounder welds*

Crucible stainless automatic welding wire is quickly available from local stocks—in the widest range of analyses. It's packaged to fit your needs—in spools or layer wound coils.

This is the interior wall of a kraft digester used in a leading pulp mill. A stainless weld overlay is applied automatically by the inert gas consumable electrode process. 6,000 pounds of Crucible Rezistal stainless, overlay welding wire 1/16" was used to cover 1,400 square feet of area. The cost: One-third that of vessel replacement.

Next time you need welding wire – call Crucible. *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

CRUCIBLE first name in special purpose steels

Crucible Steel Company of America

Canadian Distributor — Railway & Power Engineering Corp., Ltd.

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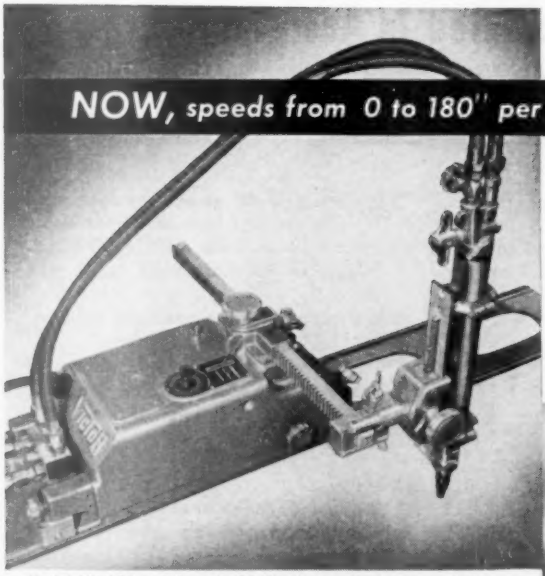
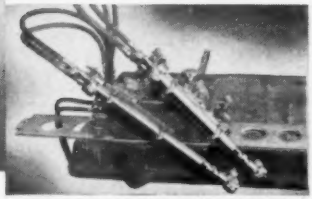


NOW, speeds from 0 to 180" per minute with new

VICTOR
PORTABLE
Flame-cutting Machine
MODEL VU-120



Model VU-120 weighs only 35 lbs. Main wheels run on ball bearings; casters swivel on ball bearings, run on oilite bearings, are shrouded as protection against slag.

Torches on Model VU-120 easily angled for bevel cuts. Machine accommodates both 2 or 3-hose torches, and in certain set-ups each holder can handle multiple torches.

Operates at same speeds forward or reverse. Cuts straight lines, circles, square or bevel kerfs. Adaptable to many automatic welding applications.

Now constant running motor and 3-position torque-converter transmission of new Model VU-120 bring you speeds from 0 to 180" per minute—forward and reverse—without loss of power at low speeds. In neutral position, machine free wheels so you can set up easily and quickly. Wide speed range enables you to adapt travel carriage to many automatic welding applications, using either submerged or inert arc.

You get remarkable accuracy from the Model VU-120. Floating rear caster practically eliminates side tilt and wobble. There's no "creeping"—shut off machine and it stops instantly. Universal torch holder accommodates any model VICTOR machine cutting torch, with or without gear rack. Two torch holders can be used if desired. Case is pre-drilled for extra torch holder, side guide roller, or counterweight.

Try the fast-operating VU-120. Ask your VICTOR dealer for a demonstration on your job NOW . . . or write us for descriptive Bulletin 353.

For maximum efficiency and safety, use genuine Victor tips and parts

VICTOR for welding

VICTOR EQUIPMENT COMPANY

Mfrs. of welding & cutting equipment; hardfacing rods, blasting nozzles; cobalt & tungsten castings; straightline and shape cutting machines.

844 Folsom St., San Francisco 7 • 3821 Santa Fe Avenue, Los Angeles 58

31

Circle No. 79 on Reader Service Card.

Literature Featured In Ads This Month

TO GET ANY OF THE REFERENCE DATA DESCRIBED HERE, CIRCLE THE APPROPRIATE NUMBER ON THE READER SERVICE CARDS IN THIS ISSUE

42 **Welding helmets, Supergoggles, electrode holders and welding circuits** are featured in complete catalog. JACKSON PRODUCTS, INC. Inside Front Cover.

38 **"Simplified" engine drive or electric drive welders** explained in illustrated literature. HOBART BROS. CO. Page 1.

82 **Salamander brochure** describes new LP line featuring "Flame Dome" for 360° heat. WELDIT INC. Page 5.

18 **Power supply cord and cable engineered for welding** is the subject of bulletin. BELDEN MFG. COMPANY. Page 6.

8 **Welding goggles that keep out sparks, light rays and splashes of metal** are featured in brochure. AMERICAN OPTICAL CO. Page 43.

37 **The right hardfacing rod for every wear problem** is recommended in literature featuring Haystellite tube rod. HAYNES STELLITE CO. Page 8.

49 **How to cut cylinder demurrage costs** is covered in bulletin. LINDE AIR PRODUCTS COMPANY. Page 37.

61 **Faster, cooler—cutting grinding wheels** of "44" Alundum abrasive are featured in circular. NORTON COMPANY. Pages 10-11.

24 **Pocket weld gauge** for accurate calibration of butt and fillet welds is described in bulletin. CHICAGO TOOL & ENGINEERING CO. Page 12.

9 **Resistance welding products** bulletin. AMPCO METAL, INC. Page 7.

20 **Welding products for all jobs** are featured in complete catalog. THE BURDETT OXYGEN COMPANY. Page 15.

28 **Spooled, coiled or cut length stainless steel welding wire** for high quality welds is circular feature. DRAWALLOY CORPORATION. Page 17.

79 **Versatile portable flame-cutting machine** adaptable to many automatic welding applications is featured in Bulletin 353. VICTOR EQUIPMENT CO. Page 21.

31 **Flexible, light aluminum welding cable** that reduces operator fatigue is covered in bulletin. GENERAL CABLE CORPORATION. Page 29.

44 **Shielded arc welding flowmeters** featured in bulletin explaining visibility and functional advantages. THE K-G EQUIPMENT COMPANY. Page 30.

47 **Universal automatic welding head manipulator** is covered in Bulletin 6960. THE LEWIS WELDING & ENGINEERING CORP. Page 31.

30 **Welding accessories and connections** that can save in 10 ways are described in illustrated literature. ERICO PRODUCTS, INC. Page 33.

If you weld "difficult" metals with MIG consumable electrodes

you can do a faster, better job with

AMPCO-TRODE* 10

BARE WIRE

Here's versatile welding at its best. Ampco-Trode 10 Bare Wire, level-wound on spools or rims for the metal-arc, inert-gas process, gives you easy, high-strength, crack-free welds on aluminum bronze, silicon bronze, and manganese bronze. You also get clean, dense deposits on iron-base metals — cast and malleable iron, galvanized iron, and high alloy steels and irons. You can even make good welds joining one of these metals to another. And Ampco-Trode 10 Bare Wire is also ideal for wear- and corrosion-resistant overlays with hardnesses of 160-190 BHN.

You get more. Ampco-Trode 10 *pre-alloyed, solid wire* feeds better through the gun with fewer burn-backs. And the deposit is more uniform, giving you mechanical properties that are superior to "so-called" substitutes. That's why this versatile electrode can make a better product for you — at less cost. See your Ampco Weldrod Distributor.

Write for Bulletin W-17

AMPCO

Sole producer of genuine Ampco Metal

AMPCO METAL, INC.

Dept. IW-12, Milwaukee 46, Wisconsin

West Coast Plant • Burbank, California

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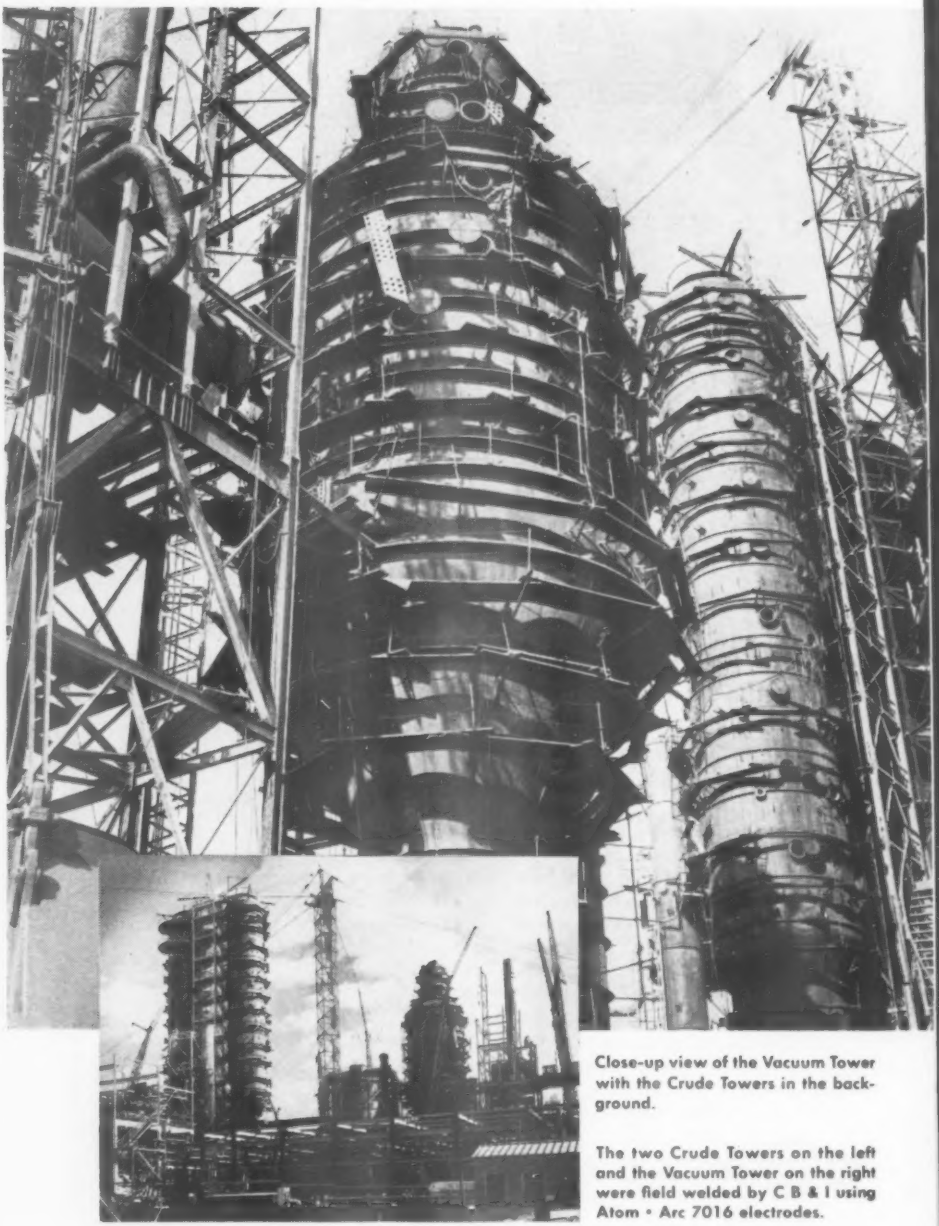


Close-up view of the Vacuum Tower with the Crude Towers in the background.

The two Crude Towers on the left and the Vacuum Tower on the right were field welded by C B & I using Atom • Arc 7016 electrodes.

Circle No. 4 on Reader Service Card.

Welded with ATOM·ARC 7016

◁◁◁◁ CB&I reports more than 1 1/4 miles of field welds with less than 1/5 of 1% of X-rayed welds chipped and re-welded!

Chicago Bridge & Iron Company, one of this country's leading builders of tanks and processing structures, used Atom • Arc 7016 electrodes on this field erection job at the Sinclair Refinery in Marcus Hook, Pennsylvania. Their report on the building of this 138-foot Vacuum Tower and the two 176-foot Crude Towers makes amazing reading. For example, on the Vacuum Tower there were 2500 feet of field welds with only 8 inches of X-rayed welds that had to be chipped out and re-welded.

A summary report shows that there were 649 X-rays made on the job. 626 were satisfactory, 23 showed defects of one kind or another but only 15 were defects in field welding. A total of 6720 feet of welds (over 1 1/4 miles) were made with Atom • Arc 7016 electrodes and only 12 feet of X-rayed welds had to be chipped out and re-welded (less than 1/5 of 1%)!

All stainless clad sections in these towers were welded with Arcaloy 309 Stainless Steel Electrodes.

Quality workmanship is the paramount consideration at Chicago Bridge & Iron. Their report on this Sinclair job is enough to indicate that they get this high quality with Atom • Arc electrodes.

You'll want "Atom-Arc quality" on your jobs too. Contact your Alloy Rods Company distributor or write for informative Data Sheets.

Hortonspheroid* Storage Tank at Sinclair site, majority welded completely with Atom • Arc electrodes.
*Chicago Bridge & Iron Co.

Alloy Rods Co.

General Offices and Plant
York 2, Pennsylvania
Pacific Coast Sales Offices and Plant
El Segundo, California

no finer electrodes made... anywhere

Circle No. 4 on Reader Service Card.

NEWS of the WELDING INDUSTRY

K-G Names Hickey Regional Manager

Thomas A. Hickey has joined K-G Equipment Co., Allentown, Pa., as Regional Sales Manager it was announced by Karl Schmuldt, vice president.

Hickey will work with company's distributors in the Southeast Zone. Formerly with Gasweld Division of Liquid Carbonic Corp., Hickey has 18 years experience in the welding field.

I.A.A. Conventions Set

Dates and locations for the 1957 and 1958 International Acetylene Association conventions have been fixed.

The 1957 meeting, originally planned for April 8-10, Hotel Nicollet, Minneapolis, Minnesota, was moved up to April 1-3 to avoid conflicting with the American Welding Society Spring Meeting.

Philadelphia was the place chosen for the 1958 convention. The Program, Publicity and Arrangements Committee decided on the Bellevue-Stratford Hotel, March 19-21, after a visit to the Quaker City.

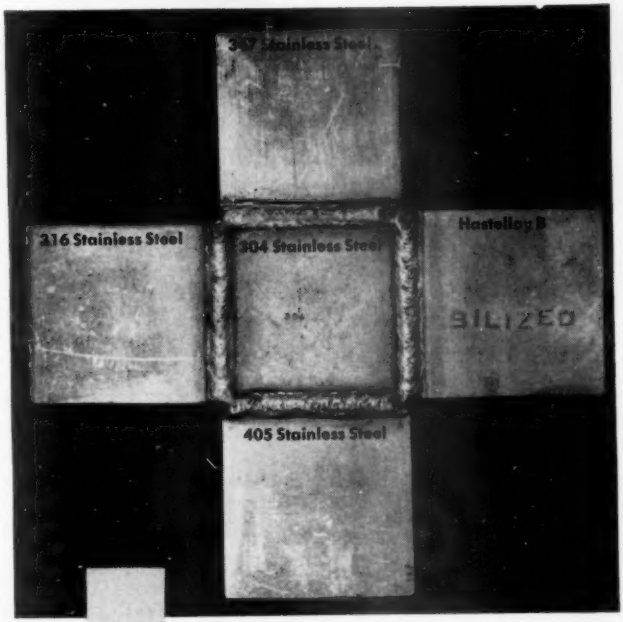
Discuss Welding at Maintenance Show

Maintenance welding has been added as a topic for the Eighth Plant Maintenance and Engineering Conference to be held at Public Auditorium, Cleveland, Ohio, January 28 through 30, Lew Gilbert, executive editor of INDUSTRY & WELDING and WELDING ILLUSTRATED, will head the maintenance welding session. He will be assisted by V. J. Richilano, assistant superintendent of Methods and Equipment and of Maintenance at Cleveland Ordnance Plant of General Motors Corp.

Heads Advertising for Miller Electric

Appointment of J. G. Waldron as advertising manager has been announced by Miller Electric Mfg. Co., Appleton, Wis. Waldron has been with Miller for the past three years as sales correspondent and managing editor of Memco News. He will continue to act as editor of this publication in addition to his new duties.

More News on Page 28



Inco-Rod "A" produces strong, sound, ductile welds in a wide variety of dissimilar alloys. In *this* test specimen it joined four different alloys to the Type 304 Stainless Steel plate at center.

Versatility is the big plus you get only with Inco-Rod "A"

In this 4-to-1 test specimen, Type 304 Stainless Steel is joined to Types 405, 316, and 347 . . . and to Hastelloy B.

There's *proof* of versatility . . . the big plus that Inco-Rod "A"* electrode alone can give you. It welds *most* dissimilar alloy combinations . . . ferritic and austenitic stainless steels, low alloy steels, mild steels, high nickel alloys, and other alloys.

Welds are strong, ductile, corrosion-resisting . . . of X-ray quality. And Inco-Rod "A" is *easy*-handling . . . with spray type arc, good slag removal.

Write Inco's Mechanical Engineering Section and ask about the alloys *you* want to weld. New, unpublished data on Inco-Rod "A" electrode may provide a ready answer to your problem.

*Trademark of The International Nickel Company, Inc.

The International Nickel Company, Inc.
67 Wall Street New York 5, N. Y.

INCO-ROD "A" electrode is supplied in 14-inch lengths in four diameters, 3/32-, 1/8-, 5/32-, and 3/16-inch (the 3/32-inch is center grip)... packed in 5-lb. containers.

INCO **Welding Products**
Electrodes • Wires • Fluxes

Circle No. 41 on Reader Service Card.

All-State Appoints Regional Managers

Two new regional managers have been named by T. D. Nast,

STROTHER

NORDIN

president, All-State Welding Alloys Co., Inc. They are John Strother and Robert Nordin. Mr. Strother is serving in seven of the East South Central and South Atlantic States. Mr. Nordin is covering the Southern Gulf States.

Film on Positioning

A brand new, full color 35 mm sound slide film on Worthington Corporation's full line of positioning equipment is available. The 18-minute narrated film covers ABC's of welding positioners, automatic manipulators and turning rolls.

Film may be obtained by writing to Advertising and Sales Promotion Department, Worthington Corp., Harrison, N.J.

Ford and Associates Change Address

A change of address to 3120 Maple Drive, N.E., Atlanta, Ga., has been announced by Frank F. Ford, head of Frank F. Ford and Associates. New telephone numbers are Cherokee 5372 and 3646.

Well-known in the South, the firm serves as manufacturers representatives for firms making welding equipment, supplies and accessories.

(More News on Page 116)

Stulz-Sickles Co., Newark, N.J., held their annual sales conference recently at The Homestead, Hot Springs, Va. Ten district sales managers met with B. H. Payne, chairman of the board; R. K. Chapin, president; and R. Bramley, sales manager, to discuss sales policies for the coming year. At the Company's annual dinner, Mr. Payne was presented an engraved silver tray in honor of his 35 years service with the firm. Plans were made for the 1957 conference to be held in Northern New Jersey and to include an inspection tour of the new Stulz-Sickles plant which will open shortly in Elizabeth, N.J.

Aluminum Welding Cable

Makes Your Job

Easier!

Saves Effort!

Lighter weight and superior flexibility lets you weld faster and easier on every job . . . less operator fatigue!

Type D-866 Aluminum Welding Cable is available in all standard sizes from General Cable.

General Cable . . . *at your service!*

GENERAL CABLE CORPORATION, 420 Lexington Avenue, New York 17, N. Y.
Offices and Distribution Centers Coast-to-Coast

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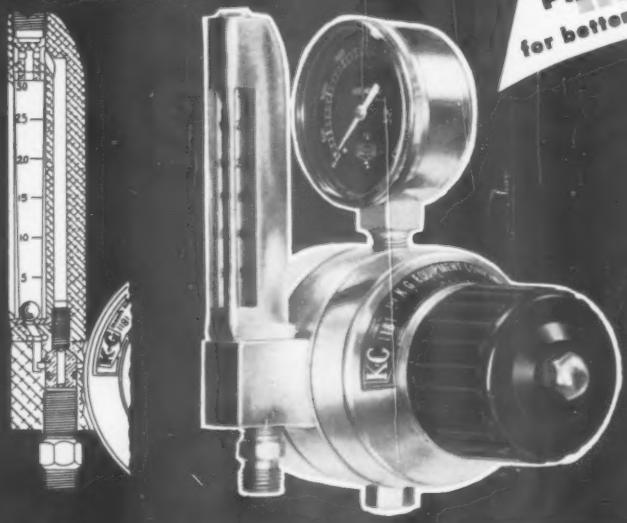
SO RUGGED...

Another NEW PRODUCT for better welding



...YET SO SIMPLE

Flow* Controls by K-G

Accurate - Dependable

Here is an entirely new, remarkably simple, completely functional flowmeter. Flow* Controls by K-G provide maximum accuracy, visibility and safety in controlling the flow of Argon, Helium and CO_2, for your shielded arc welding.

The Pyrex Glass "heart" is safely mounted in a tough aluminum alloy housing making it virtually unbreakable. Sharp black graduations and numerals make for easy, accurate reading and quick flow rate adjustments.

For further information and prices, write to

THE K-G EQUIPMENT COMPANY (Inc.)

A Unit of Air Products, Inc.

Dept. B Box 538, Allentown, Pa.

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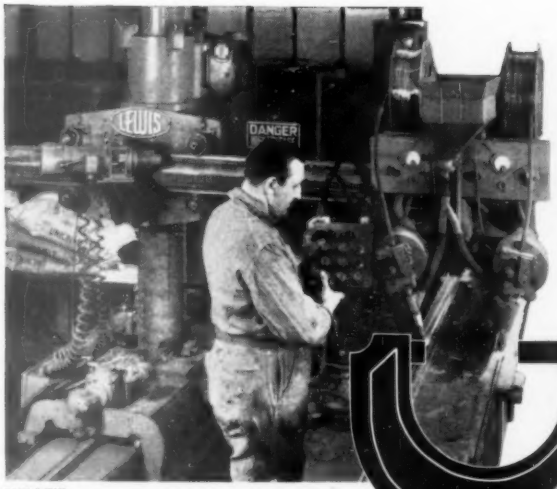


7268-LWE

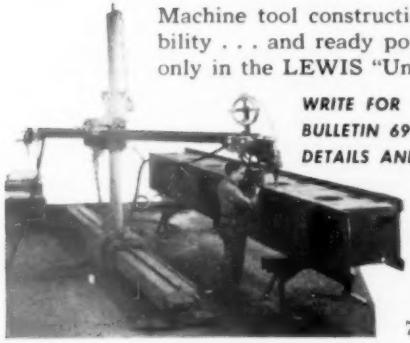
ONLY THE LEWIS "UNIVERSAL" GIVES YOU MACHINE TOOL ACCURACY . . .

FOR EVERY AUTOMATIC WELDING JOB

For precision welding . . . plus portability . . . none can equal the LEWIS automatic welding head manipulator. Heavy-duty design and construction . . . hardened and ground machined ways . . . make the "Universal" both machine tool accurate *and* portable.

Once a "Universal" is positioned . . . a quick, easy job . . . it operates accurately and consistently. It releases valuable production floor space ordinarily consumed by a fixed installation. In addition, it will accommodate any standard submerged arc, inert gas-shielded arc or other type of welding head.

Machine tool construction and precision . . . complete adjustability . . . and ready portability are standard features available only in the LEWIS "Universal".



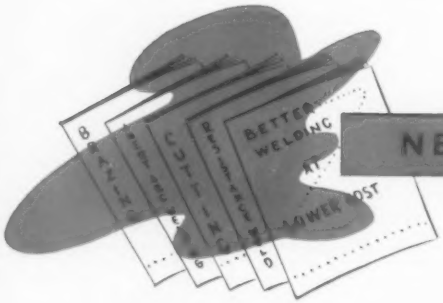
WRITE FOR BULLETIN 6960 FOR DETAILS AND PRICES

LEWIS

THE LEWIS WELDING & ENGINEERING CORP.

70 Interstate Street • Bedford, Ohio

Circle No. 47 on Reader Service Card.



NEW REFERENCE DATA

The publications featured on these pages were written by experts. They are FREE to our readers. To obtain these helpful reference materials use postcard bound into this issue.

NEW DEVELOPMENTS IN BLACK LIGHT INSPECTION are introduced by Magnaflux Corp. in its bulletin on that subject. Featured are new 400 watt lights which are more economical and efficient than a battery of 100 watt lights for area-lighting of large surfaces. All regular 100 watt and the new 400 watt black lights are featured in the folder. **Circle No. 90 on Service Card.**

OXY-ACETYLENE WELDING ACCESSORIES made by K-G Equipment Co., Inc. are included in a new Accessories Catalog. It is a companion piece for the standard K-G Welding and Cutting Equipment catalog. **Circle No. 91 on Reader Service Card.**

NEW ENGINE DRIVEN WELDERS SAVE by boosting welding speed is claim for new line in illustrated brochure by General Electric Company. Features such as a geared governor, pusher-type engine fan and controlled current peaks are described in detail. **Circle No. 32 on Reader Service Card.**

USED IN ALL INDUSTRIES . . . EVERYWHERE is the way in which Chicago Tool and Engineering Co. described its Palmgren line. Featured in company's complete catalog is well rounded line of angle, machine and drill press vises. Cross slide milling table, rotary and indexing table and tilting indexing and rotary table are covered along with milling attachment that converts engine lathes for milling in 10 seconds. **Circle No. 93 on Reader Service Card.**

IF YOU CHECK YOUR SCRAP PILE, chances are you'll find many worn parts that should be salvaged. Stulz-Sickles Co. has issued a handy pocket-sized folder which explains how to use its 11-13½% manganese-nickel steel products to salvage earthmoving parts, tractor parts, truck bottoms and conveyor chain wear-strips. **Circle No. 94 on Reader Service Card.**

COLD GALVANIZING COMPOUND which can be used to repair damaged galvanized surfaces, to provide rust protection and prevent corrosion is introduced in handy pocket-size folder issued by American Solder & Flux Co. Leaflet describes how compound is used. It is available in powder, stick and bar form. **Circle No. 95 on Reader Service Card.**

LAYOUT LINES 100 TIMES BRIGHTER than soapstone is the description of reflective marking material given in important folder available from Brite-Line Corporation. Known as Brite-Line, material comes in kit form and is said to go on easily and stay on. **Circle No. 88 on Reader Service Card.**

SEAMLESS FORGED AND ROLLED RINGS made by Alco Products, Inc. are featured in 16-page bulletin just issued. Contained in bulletin is a handy 4-page chart showing, in ⅛-inch divisions, weights for rings from one inch to 145-inches overall-diameter. **Circle No. 97 on Reader Service Card.**

AIR IS USED WIDELY FOR POWER IN INDUSTRIAL APPLICATIONS. How air can be controlled and harnessed for efficient and economical use is explained in Bulletin 101A from Ross Operating Valve Co. Bulletin describes and illustrates company's complete line control valves and tells how they work. **Circle No. 98 on Reader Service Card.**

(Turn to Page 35)

EQUIP YOUR PLANT FOR 1957

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2. Reduced maintenance
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WHEN YOU WELD...

ARCOS can save you time and money

In our long association with stainless fabricators, we have learned that their first and last interest in electrodes is the production of sound weld metal. Arc characteristics, ease of slag removal, bead appearance are all plus qualities easily evaluated but sound welds *on every job* and *from every pound of electrodes* are vital to the user's reputation.

We have learned, as manufacturers, that stainless electrodes of a quality which will produce sound weld metal *all the time* are achieved only through a considerable expenditure of technical skill in testing and retesting. Arcos electrodes which do not produce trouble-free welds under our strict quality control tests are rejected *before they reach our warehouse.*

Extensive care by Arcos in processing its stainless, low hydrogen and non-ferrous rods and electrodes pays out in the elimination of costly chipping and rewelding or failure in service. ARCOS CORPORATION, 1500 South 50th St., Phila. 43, Pa.

TAKE ADVANTAGE OF THESE VALUABLE ARCOS SERVICES

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WELD WITH ARCOS

For Quality Weld Metal Easily Deposited

COATED AND BARE ELECTRODES AND RODS FOR WELDING STAINLESS, LOW ALLOY, ALUMINUM, NON-FERROUS METALS

Circle No. 13 on Reader Service Card.

SIX DIFFERENT TYPES OF RADIOGRAPHY UNITS and how to use them for industrial applications are described in illustrated 12-page booklet from Instruments Division, North American Philips Co., Inc. Booklet shows photos and characteristics of all instruments listed and indicates proper unit to use for various thicknesses of steel and aluminum. **Circle No. 99 on Service Card.**

SPECIAL SOLDER ALLOYS and how to use them on cast iron, aluminum, stainless steels and die castings is explained in bulletin published by Anchor Metal Co., Inc. Bulletin gives step-by-step instructions for proper use of each. **Circle No. 100 on Reader Service Card.**

PROTECT COSTLY ELECTRODES, PREVENT WELD METAL DEFECTS with new moisture content stabilizer manufactured by Fred C. Archer, Inc. according to literature available from them. New 550# capacity Model 724SAE Aridair Stabilizer is equipped with twin chemical dehydrators and thermostatic control from 150° to 550°. **Circle No. 87 on Reader Service Card.**

A NEW, HIGH-STRENGTH MANGANESE BRONZE FILLER ROD for oxy-acetylene welding has been introduced by Ampco Metal, Inc., and is featured in Bulletin 56L-171. Rod is described as being of uniformly high quality and is said to be an all-purpose general maintenance filler rod for brazing dissimilar metals, braze-welding cast iron and steel castings and for building up parts which wear or are subject to corrosion. **Circle No. 102 on Reader Service Card.**

"DESIGNER'S GUIDE FOR ELECTRIC RESISTANCE WELDING" is a must for anyone using that process. Just issued by Sciaky Bros. Inc., new Bulletin 331 contains 12-pages covering overall design consideration and specific design instruction of resistance welding techniques. Specific fastening methods discussed in detail are spot, seam, projection and flash-butt welding. **Circle No. 103 on Reader Service Card.**

TECHNICAL INFORMATION ON 12 "4100 SERIES" OF ALLOY STEELS is presented in new 4-page folder TDC-184 issued by Tubular Products Division of Babcock & Wilcox Company. Condensed data is given on welding, machining, and heat treating of seamless mechanical tubing made of these steels. Mechanical properties are given for each. **Circle No. 104 on Reader Service Card.**

A COMPLETE MANUFACTURING SERVICE FOR BRAZED ASSEMBLIES is described in a new 4-page illustrated 2-color catalog available from Wall Colmonoy Corp. Catalog discusses design, development and manufacturing facilities of company's new Wallco Manufacturing Division. **Circle No. 129 on Reader Service Card.**

NEWS ABOUT AUTOMATED SPEED CONTROL is contained in Bulletin No. C-100 issued by Graham Transmission, Inc. Bulletin tells how company's variable speed drive can control electrical and hydraulic systems automatically from any leading recorder. Precise control is available from zero to any top speed. **Circle No. 105 on Reader Service Card.**

PORTABLE ELECTRO-MAGNETIC DRILL PRESS and how and where to use it is the subject of 4-page catalog from Portomag, Inc. Punches for easy insertion in shop notebooks, catalog gives typical applications, specifications and operating characteristics. **Circle No. 106 on Reader Service Card.**

HOW TO BRAZE CARBIDE TOOL TIPS with silver brazing alloys is story told in Bulletin 11-A issued by Handy & Harman. Step-by-step instructions are given for brazing carbide to tool tips using torch, furnace, gas-air burner or induction brazing. **Circle No. 107 on Reader Service Card.**

HOW NEW WELDING IGNITRON TRADE-IN PLAN REDUCES MAINTENANCE COSTS is explained in folder just published by the Westinghouse Electric Corp., Electronic Tube Division. Company's offer for a free survey of your tube requirements is also covered. **Circle No. 84 on Reader Service Card.**

(Turn to Page 36)

METAL WORKING EQUIPMENT FOR ALL INDUSTRIAL USES is described and illustrated in complete brochure from Webb Corp. Featured are slip roll forming machines, plate bending rolls and combination punches and shears. Operating instructions and design details and specifications are furnished. **Circle No. 109 on Reader Service Card.**

RECOMMENDATIONS FOR SUCCESSFUL GRINDING are to be found in Catalog 103 issued by A. P. deSanno & Son, Inc. Bulletin contains information on company's complete line of grinding wheels. **Circle No. 110 on Reader Service Card.**

MATERIALS AND ACCCESSORIES FOR INDUSTRIAL RADIOGRAPHY is the title of a complete and comprehensive reference manual published by Eastman Kodak Co., X-Ray Division. Films, developers and dark rooms aids are featured. **Circle No. 111 on Reader Service Card.**

INDUSTRIAL WIRE ROPE RECOMMENDATIONS can be found in information-packed Bulletin DH-128D issued by American Cable Division, American Chain & Cable Co., Inc. Twenty-four page bulletin covers more than 120 different types of wire ropes used in industry. Each recommendation covers such points as rope diameters, construction, preforming, lay, grade and core. Charts and photographs illustrate bulletin. **Circle No. 112 on Reader Service Card.**

BRAZING MANUAL FOR THE SERVICE TRADES is available from All-State Welding Alloys Co., Inc. Handy, pocket-sized 22-page booklet contains data for brazing, shapes, sheet, castings, tubing and assemblies of copper, brass, steel, aluminum, and cast iron. **Circle No. 113 on Reader Service Card.**

HOW TO CUT PIPE WITH SPEED AND ACCURACY is the subject of catalog offered by H & M Pipe Beveling Machine Co. Catalog explains how company's pipe cutting and beveling machine can increase speed, economy and accuracy in pipe cutting and fabrication work. Operating instructions are given for two attachments, one for cutting out-of-round pipe and one for shape cutting. **Circle No. 39 on Reader Service Card.**

PROTECTIVE LEATHER CLOTHING FOR WELDING OPERATORS is featured in handy pocket-sized folder issued by Aljay Mfg. Co. Described and illustrated is company's line of coats, sleeves, aprons, capes, bibs, pants and chaps. **Circle No. 114 on Reader Service Card.**

"THIS IS MALLORY" is the title of a book which took 40 years to write. This is the case because the book is a history of P. R. Mallory & Co., Inc., published in conjunction with the company's 40th anniversary. Facilities and services, including those for making resistance welding alloys and parts, are described and illustrated. **Circle No. 115 on Service Card.**

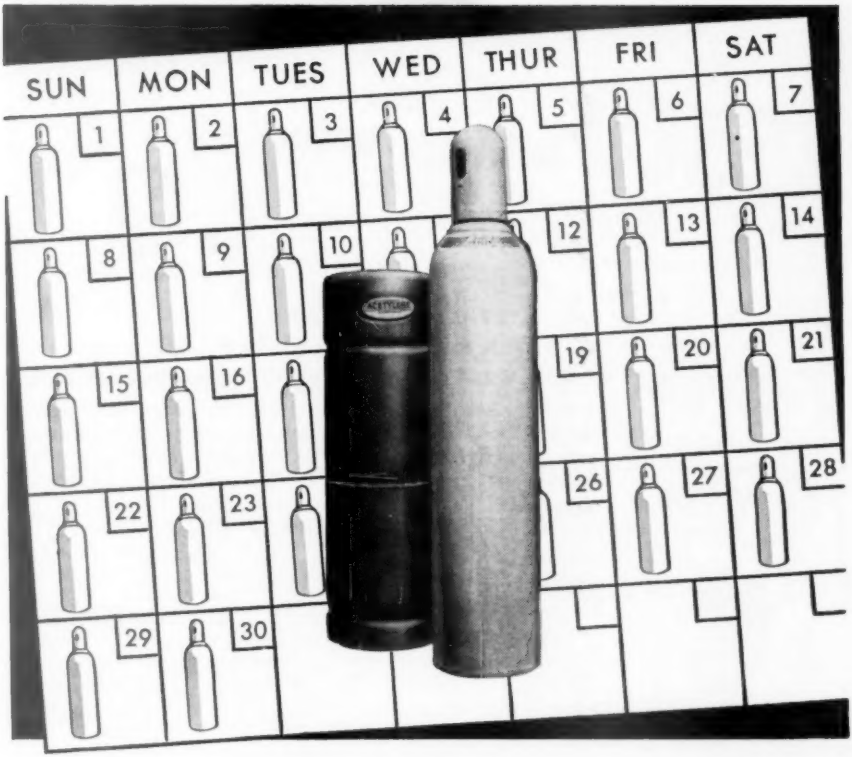
ULTRASONIC INSPECTION EQUIPMENT and how it can be used for nondestructive detection and location of defects is the story told in Bulletin 50-105 from Sperry Products, Inc. Colorful brochure gives a short course in principles of ultrasonic inspection principles and equipment. **Circle No. 116 on Reader Service Card.**

44 ELECTRODE TYPES are cataloged for handy reference in new 28-page Catalog EW-195 issued by Hobart Bros. Co. Catalog gives applications, procedures, recommended currents, physical properties and sizes available. **Circle No. 117 on Reader Service Card.**

"THE TWECO WORLD" is the title of an interesting and unusual newspaper-type literature item issued by Tweco Products, Inc. Featured are application stories covering company's line of electrode holders and connectors and aluminum welding cable. **Circle No. 118 on Reader Service Card.**

INERT GAS SHIELDED SPOT WELDER made by Linde Air Products Co. is subject of colorful 6-page catalog. What process is, how equipment is used and what accessory equipment is needed is covered in catalog which also tells how to use welder for plug and tack welding. **Circle No. 119 on Reader Service Card.**

(Turn to Page 39)



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General Equipment Corporation
261 Franklin Street

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Averill Equipment Company
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Circle No. 23 on Reader Service Card.

TUNGSTEN CARBIDE TUBE ROD FOR ACETYLENE APPLICATION is the product described in a colorful, punched-hole folder made available by Diamond Metal Company. Known as Diamondtube A, rod is fabricated mild steel tube containing special tungsten carbide in several screen sizes and said to do an effective, long-lasting buildup job on any part subject to wear. **Circle No. 120 on Reader Service Card.**

CLAMPS DESIGNED FOR WELDING is the way in which Chicago Boiler Company describes its "Red Head" welding clamps. Literature from the company describes the clamps' solid plate body and threads that are protected from weld spatter. **Circle No. 121 on Service Card.**

HOW TO REBUILD WORN TRACTOR PARTS is completely shown in concise folder form available from Stulz-Sickles Co. Diagrams showing where proper Manganal plates, shapes and electrodes can be used for long-wearing, economical advantage, are given. **Circle No. 122 on Reader Service Card.**

GAS CYLINDER TRUCKS are the subject of catalog sheet issued by Simmons Supply Co. Described, illustrated and priced are deluxe model with semi-pneumatic tires and ball bearing wheels and standard model with steel wheels and babbit bearings. **Circle No. 123 on Reader Service Card.**

COMPLETE LINE OF MAGNETIC TOOLS FOR WELDING is featured in complete and concise catalog from Magnetic Tool Corp. Described and illustrated are magnetic drills presses and plate clamps and recently introduced magnetic welding fixture which holds ferrous metals in position at any angle without setup time. Prices and specifications are given. **Circle No. 124 on Service Card.**

"THE FIGHT AGAINST FAHRENHEIT," a new, 2-color, 12 page booklet which describes the importance of the U. S. Patent System to its research and development of advanced metal-joining alloys and processes, is available from Eutectic Welding Alloys Corp. Booklet TIS 2644 traces the history of welding from the 13th century forge and water operated bellows or "leather lungs" used by the blacksmith. **Circle No. 125 on Reader Service Card.**

BETTER WORK-HOLDING DEVICES are featured in 4-page catalog from West Point Mfg. Co. Described and illustrated in detail is company's recently developed "Swinglock" clamp which is said to operate in any position and can be closed or opened with flick of the wrist or turn of a wrench. **Circle No. 83 on Reader Service Card.**

A VARIETY OF RESISTANCE WELDING APPLICATIONS is described in "Weld-It," a 4-page bulletin issued by Taylor-Winfield Corp. No. 569 describes automatic projection welding of zinc-phosphate coated steel, and use of special welds for increased production at reduced cost. **Circle No. 126 on Reader Service Card.**

HOW FLUX RECOVERY SAVES TIME AND MONEY is the subject of an illustrated folder prepared by Invincible Vacuum Cleaner Mfg. Co. Advantages of system which recovers all unused flux, screens out undesirable fines and slag and returns it to welder hopper automatically are described. **Circle No. 127 on Reader Service Card.**

HOW TO POLISH COMPLEX CONTOURS and still get maximum abrasive usage is explained in a bulletin from Behr-Manning division of Norton Company. Bulletin introduces company's new Kon-Toor wheel and explains why this wheel, which can be shaped or shapes itself, is a "natural" for rotary, straight-line and semi-automatic set-ups. **Circle No. 128 on Reader Service Card.**

COMPLETE WELDING CATALOG offered by Burdett Oxygen Co. lists a variety of equipment including that used for arc, gas and resistance welding. Complete line of safety equipment and protective clothing is also included. **Circle No. 20 on Reader Service Card.**

(Turn to Page 40)

NEW REFERENCE DATA

from page 39

INDUSTRY'S MOST VERSATILE SUBMERGED ARC WELDER is the way in which Lincoln Electric Co. describes its new Lincolnweld equipment. Complete catalog describes equipment for AC and DC welding, power sources and accessory equipment, including coiled wire electrodes and submerged arc fluxes. **Circle No. 35 on Reader Service Card.**

A HANDY POCKET ENCYCLOPEDIA OF PRACTICAL WELDING KNOW HOW is the way in which All-State Welding Alloys Co., Inc., describes its new 52-page reference manual. Manual provides instructions, suggestions and hints for welding and cutting all metals. Maintenance operations are stressed. **Circle No. 132 on Reader Service Card.**

SELENIUM RECTIFIERS made by General Electric Co. are featured in Bulletin GEA-6545. This 12-page catalog gives features, applications, charts, construction, dimensions, specifications and other data on ¾ KW to 125 KW selenium rectifiers as well as multiples to 500 KW. **Circle No. 133 on Reader Service Card.**

COMPLETE LINE OF ARC WELDING ACCESSORIES is featured in handy booklet offered by Erico Products, Inc. Described and illustrated are electrode holders and cable connecting device. **Circle No. 30 on Reader Service Card.**

HOW TO WELD CAST IRON and join cast iron to steel or copper if you use C. E. Phillips & Co. new 100-X fabricated copper-steel electrode. Versatility, properties and procedures are explained in illustrated bulletin. **Circle No. 65 on Reader Service Card.**

CHECK ELECTRONIC WELDING CIRCUITS with one of several versatile oscilloscopes designed especially for your particular application by Waterman Products Co., Inc. Illustrated brochure which lists all models and complete specifications for each, also includes specifications for the company's Rayonic cathode ray tubes. **Circle No. 130 on Reader Service Card.**

Prepared for arc welding, vee in cracked ring is much narrower than required for brazing.

Arc welded with Phillips 100-X electrodes, crack is quickly and easily repaired.

FREE Write for valuable application data

MODERN, LOW COST WAY TO WELD CAST IRON

Using new PHILLIPS 100-X arc welding electrodes, Elton's Welding Service, Plymouth, Mich., saved almost the total original cost of the casting by repairing this heavy cast iron ring (101" I.D.—1½" thick) in 1¾ hours. This was a time savings of almost 2 hours over previous brazing method. Replacement cost would have been about $600.

PHILLIPS 100-X ELECTRODES

- *Handle easily on AC or DC*
- *Welds Can Be Stopped and Started —or Run Continuously*
- *Made of Fabricated Copper and Steel —with Special Coating*

C. E. PHILLIPS & COMPANY
2750 POPLAR STREET • DETROIT 8, MICHIGAN

Circle No. 65 on Reader Service Card.

NEW IMPROVED HARD FACING

Tough, hard ceramic coatings provide superior bearing surfaces

Sprayed alumina forms "sapphire-hard" surfaces highly resistant to wear, abrasion and corrosion. Ideal for bearing surfaces, seals.

Development of the new METCO THERMOSPRAY GUN for spraying high-melting-point ceramic materials at low cost opens up a variety of new practical applications. One that has produced a great deal of interest is the use of sprayed alumina coatings for bearing surfaces and mechanical seals. This THERMOSPRAY 101 Ceramic Powder produces surfaces with a hardness of 9.0 on the Moh scale, (only the diamond rates 10.0) with excellent resistance to wear, abrasion and corrosion. When used in combination with special phenolic or furane plastic sealers it provides superior protection against many acids.

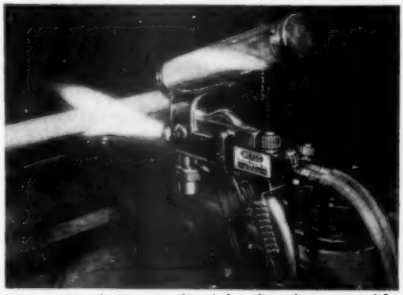
Another THERMOSPRAY Powder – 201 – is zirconia which is somewhat softer than No. 101 but provides superior heat-insulating properties. Melting point of this material is 4600° F. and particle hardness 8.0 on the Moh scale.

Hard-facing alloys of the self-fluxing, nickel-boron-silicon type in powder form can also be applied with the METCO Type P THERMOSPRAY GUN. These coatings may be fused, semi-fused, or left unfused depending on the hardness desired, from RC 30 to RC 65, depending on the alloy and the process used.

The new THERMOSPRAY GUN operates without compressed air, only oxygen and acetylene being required. The free-flowing THERMOSPRAY powders are fed to the flame nozzle from a hopper atop the gun, melted and propelled to the surface to be coated. These materials are sprayed many times faster (up to 15 sq. ft. per hour—.010" thick) than has been possible with equipment previously available. Deposit efficiencies are in excess of 95%. These factors result in extremely low coating costs.

Preliminary engineering data contained in Bulletin 127 covers ceramic coatings while Bulletin 126 covers the hard-facing alloys. Either or both may be obtained by filling out the coupon below or writing on your company's letterhead. No obligation, of course.

The following trade names are the property of Metallizing Engineering Co., Inc. METCO®, THERMOSPRAY. *®Reg. U.S. Pat. Off.*



Pump rod sprayed with alumina provides superior protection against abrasion and corrosion

METCO®

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Please send me ☐ free Bulletin 127 (ceramic coatings)
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Circle No. 54 on Reader Service Card.

Silver Brazing Alloys

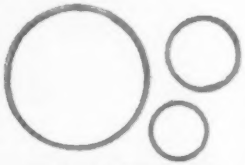
Used in Many Hospitals Where Safety Means Life or Death

Sound, leak-proof joints are a MUST in hospital construction requiring the piping of Oxygen and Anesthetic Gases to wards, rooms and nurseries *for instant use!* That's why leading designers and contractors specify dependable GB Silver Brazing Alloys, Preformed Rings and Fluxes.

GB Preformed Rings, for example, assure stronger, safer everlasting joints. They save time, require less metal, meet all specifications, cost less. Perhaps life or death are not a factor when you do silver brazing, but the dependability, efficiency and economy provided in GB products are good reasons for their choice . . . especially when they cost so little.

. . . Shown above is typical installation of oxygen wall outlet, snap coupler and flow meter. GB Preformed Rings are used to braze (1) wall assembly to screen; (2) tube to regulator; and (3) tube to gauge. For complete data write today.

GB FLUXES are fully active, deep penetrating, stable and economical. Produced under strict laboratory control they are extremely effective in producing high quality joints.



GB PREFORMED SILVER BRAZING RINGS are available in a wide range of sizes for all requirements. They are easy to use, save time and labor, assure lasting results.

GB SILVER BRAZING ALLOYS are made in random coils, strips and many special shapes in addition to preformed rings. Also available is Goldsmith's Technical Service Division cooperation for competent assistance in all brazing problems.

Dealer Distributor Inquiries Invited **Write for GB Data Book**

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Circle No. 33 on Reader Service Card.

Eye Protection

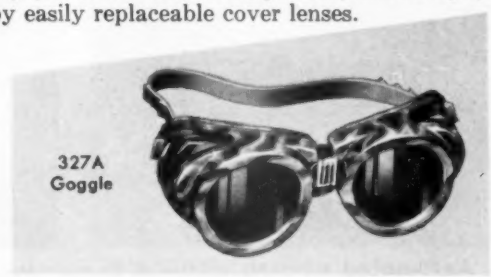
You KNOW the Quality's there in AO Welding Goggles!

404A Duraweld Goggle

For Directly Over the Eyes . . .
AO 404A Duraweld Goggle

You see this welding standby practically everywhere there's acetylene welding, cutting, burning, brazing and furnace operations. Its deserved popularity comes from a side shield design which keeps out stray light rays, sparks and metal splashes while providing indirect ventilation to minimize fogging. Eyecups fit contour of each eye, fit snugly, are low set for wide angle vision and won't conduct heat or electricity. Corrosion-resistant retaining rings. Ball-chain, insulated, quick adjusting bridge. One-piece rubber headband, easily adjustable. 50 mm. Noviweld lenses, shades 3, 4, 5, 6, 8. Or Noviweld-Didymium, shades 3, 4, 5, 6. Filter lenses protected by easily replaceable cover lenses.

For Comfortable Wear Over Personal and Safety R_x Glasses . . .
AO 327A Coverglas Goggle



327A Goggle

Even prescription glasses with side shields present no fitting problem when you select American Optical's 327A. No matter what type of glasses are worn directly over the eyes, the Coverglas Goggle will not rest on their frames — a comfort feature. Large size and shape of lenses permit 20% more vision than comparable goggles. Supplied with regular Noviweld lenses and cover lenses or Noviweld hardened, medium, dark, extra dark. Lenses easily replaceable from rear *not* front. Plastic cups. Light-tight indirectly ventilated side shields.

Always insist on the AO Trademark on lenses and frames

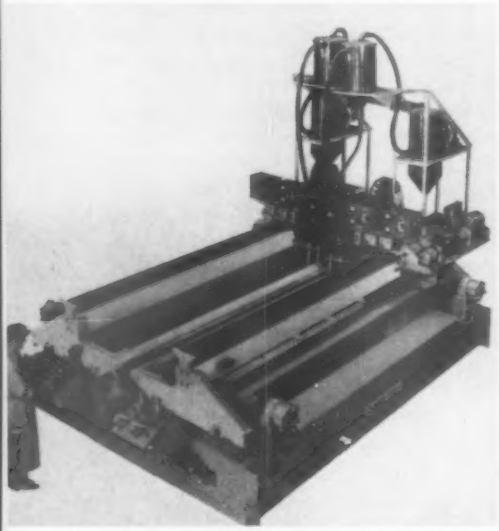
American Optical
COMPANY
SAFETY PRODUCTS DIVISION
SOUTHBRIDGE, MASS. • BRANCHES IN PRINCIPAL CITIES

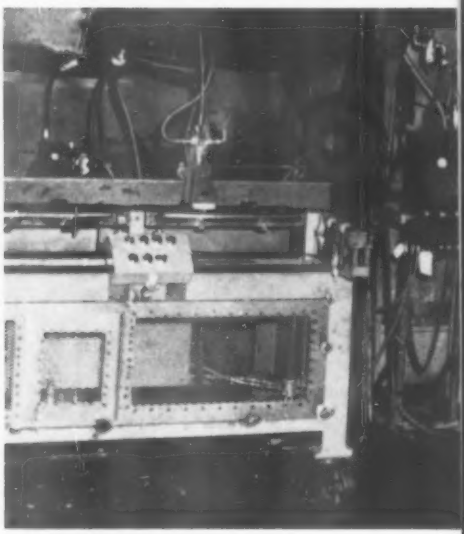
Your Nearest AO Safety Products Representative Can Supply You

Circle No. 8 on Reader Service Card.

Automation in Welding

by R. C. BECKER, Assistant General Supervisor, Welding Research, Manufacturing Research Department, International Harvester Co.





Automated welding with direct manual loading . . .

HEAVY BOX SECTION WELDER. This machine at International Harvester's Tractor Works uses four automatic submerged arc heads, welding simultaneously in the 3 and 9 o'clock positions. Heavy clamps position and hold parts, eliminating need for pre-assembly and tacking operation. Welding speed is about 36 ipm. Air-operated ram assists operator in unloading finished assembly. Making four welds at once minimizes weld distortion.

AXLE STAY ROD WELDER. Automatic carbon dioxide gas shielded arc welding machine at International Harvester's Louisville Works utilizes two clamping fixtures in conjunction with one automatic welding head. While weldment is in one, operator loads and unloads the other. This machine utilizes one of the basic principles of planning for automatic arc welding operations: maximize the duty cycle of the welding head.

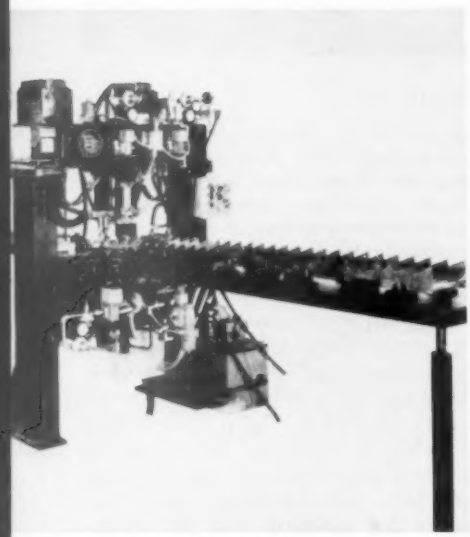
IN this discussion we will not attempt to differentiate between automation and mechanization. Rather we will use them interchangeably, dealing more with degrees of automation.

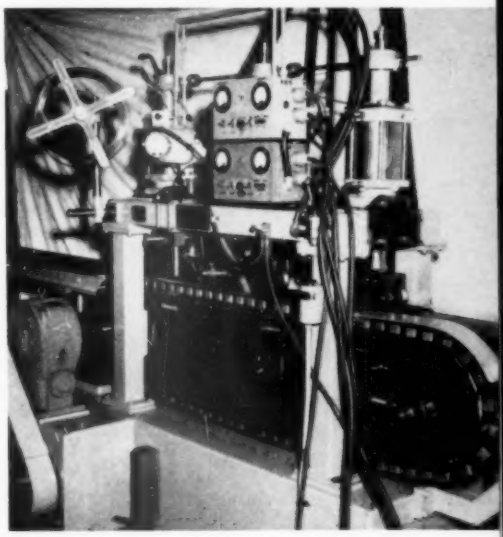
What Is Automation?

In the broad sense of the definition, automation of welding operations is not a new concept. Ever since the development of resistance welding we have had mechanized welding to some degree.

Great strides have been made in the field of arc welding during the past 25 years in an attempt to eliminate the human manipulation required in manual arc welding.

Automatic feed-back of the arc voltage, which in turn is used to maintain correct arc length, is a principle or technique of automation which has made automatic arc welding possible. Equipment for automatic arc welding has progressed to the point where high

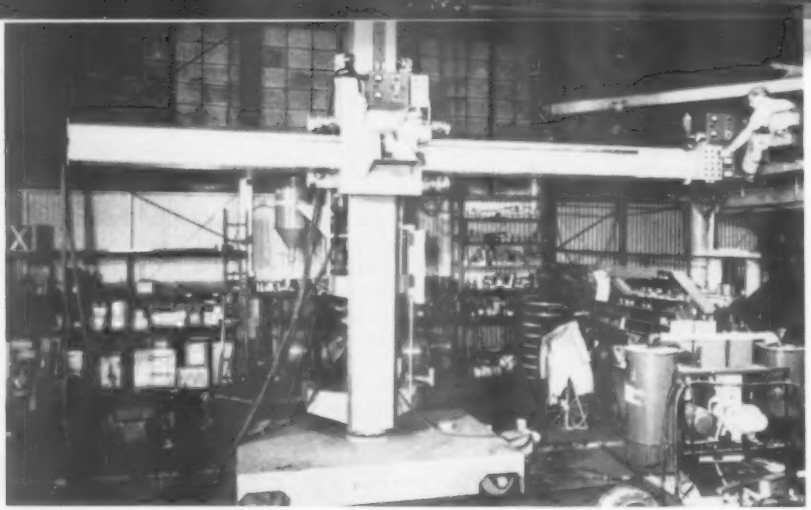




Automation by moving parts through welder . . .

STRAW RACK SPOT WELDER. This spot welder uses pass-through principle for assembling a straw rack at International Harvester's East Moline Works. Several parts are manually loaded onto the table to the right front of the machine. Magnetic clamps hold sides of straw rack perpendicular to bottom. This is important part of operation. Rack then progresses to left through machine where four simultaneous spot welds are made every 3".

SQUARE TUBING WELDER. Pass-through principle is used at International Harvester's Canton Works. Machine fabricate square tubing from structural squares. Two angles are loaded onto a table and manually pushed onto a continuous chain which pulls angles under two sets of compression and alignment rolls and between two automatic submerged arc heads. Two welds are made at 3 and 9 o'clock. Tubing is produced at 50-80 ipm.



Handling of heavy parts for welding . . .

PULPIT-TYPE HEAD MANIPULATOR. Large boom-type manipulator contains a seat for the operator near the automatic arc welding head. At operator's fingertips are a complete set of controls for moving head in any direction. This method of operation has proven to be successful where large, heavy weldments of varying types are involved. Due to ease by which operator can control movements of welding head, precise positioning of the joint to be welded is not required. (Photo courtesy Pandjiris Weldment Co.)

AUTOMATION IN WELDING . . .

quality welds can readily be produced with superior surface appearance.

Bridging the Gap

Bridging the gap between manual and automatic arc welding, we have what is sometimes called semi-automatic arc welding. In this method of welding one or more of the several human manipulations required in manual arc welding are mechanized. The relatively new consumable electrode inert gas shielded arc welding process falls into this semi-automatic classification.

Completely automated assembly lines involving welding have also been quite successful, especially in the automative and refrigeration fields.

One of the best ways to cover what has been done in the way of automation in the welding field is to describe machines and operations which have been mechanized to varying degrees. These can be divided into two main groups: (a) methods for handling the piece parts for welding and (b) combining welding with other operations.

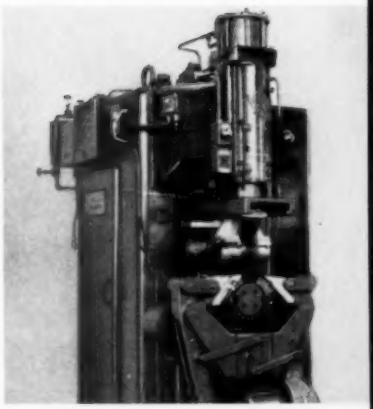
Handling Parts for Welding

Proper handling of piece parts before, during and after welding can be the key to successful automation of any welding operation. By necessity, configuration of the individual part or parts going into the weldment plays an important role in determining what is the

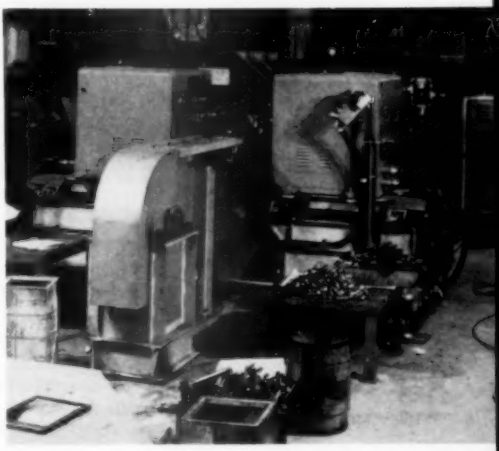
(Text continues on Page 75)

Combine welding, other operations . .

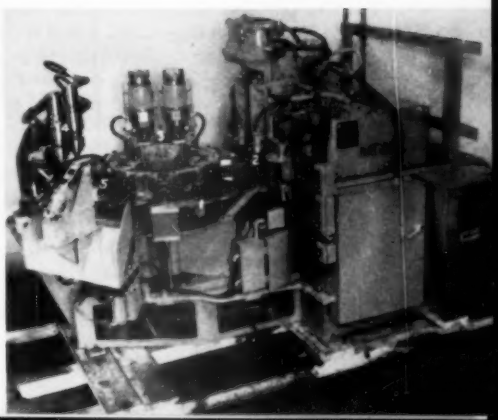
GENERATOR HOUSING MASH SEAM WELDER. This resistance welding machine combines a forming and a welding operation to produce a cylinder, 3/8-inch in diameter and from two to 10-inches long, suitable for a generator or motor housing. A straight strip of steel, pre-cut to size, is placed on the machine under the mandrel. The chain with steel strip is then wrapped up and around the mandrel, at the same time automatically providing the correct amount of overlap for mash seam welding. Seam welding wheel then rolls toward front of machine. After weld is complete, part is automatically ejected and machine cycles to its loading position. Five hundred units are produced in one hour. (Photo courtesy Resistance Welder Corp.)

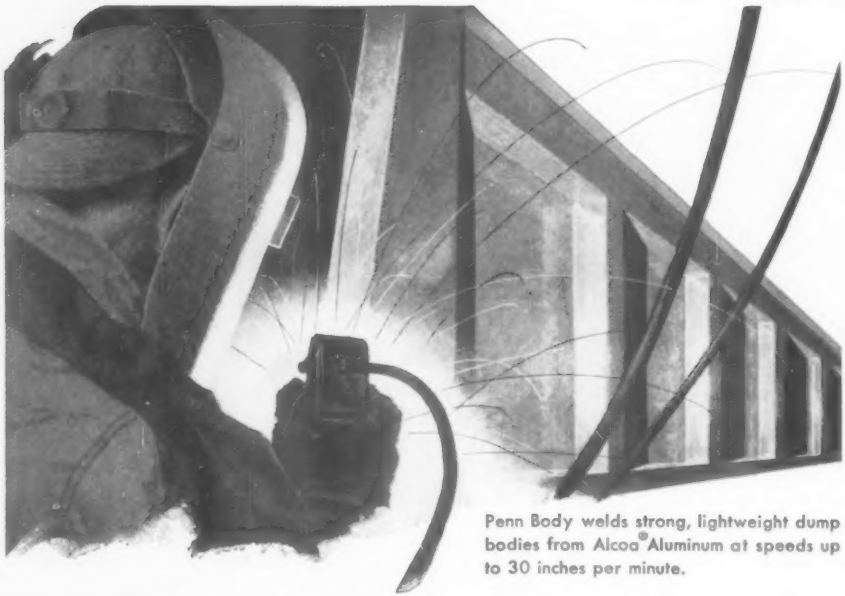


INDUCTION HEAT TREATING AND PROJECTION WELDING. These two processes are joined together by a chain conveyor. Photograph shows loading of the machine where parts—a 10-inch long and one-inch diameter C-1045 bar and formed clip — are manually placed on the conveyor. Sections of the bar near both ends are induction heat treated and quenched followed by projection welding of the clip. Completed assemblies are automatically dumped into a box at a rate of 1,000 units per hour. (Photo courtesy of Taylor-Winfield Corp.)



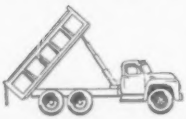
FRAME BRACKET ASSEMBLY. In this assembly unit, projection welding is combined with a punching and deburring operation to produce brackets at a rate of 640 per hour. Right and left hand assemblies are required in equal number so unit is designed to produce one of each at each station. Operations include loading two stampings for each assembly, projection welding both assemblies simultaneously, punching holes in each assembly, deburring and automatically ejected both welded assemblies. (Photo courtesy National Electric Welding Machine Co.)





Penn Body welds strong, lightweight dump bodies from Alcoa® Aluminum at speeds up to 30 inches per minute.

High-strength *aluminum* dump bodies welded fast by new process



For some time, dump truck operators have cast longing eyes at the light weight and high payloads that aluminum dump bodies would make possible. But nobody knew how to weld aluminum bodies strong enough or fast enough.

But recently two important things happened: the shielded arc, inert gas, consumable-electrode method was developed and improvements were made in Alcoa Alloy 5154. Used with the new welding techniques, alloy 5154 now provides a 25% increase in strength across welds and a 150% increase in ductility.

Speed is way up, too. Penn Body Division of Hockensmith Corporation, a leading dump body builder, butt-welds 3/16 inch sheet at speeds up to 30 inches per minute, compared with 16 inches per minute for the tungsten arc process. Depending on conditions and equipment, speeds as high as 60 to 80 inches per minute are now possible.

Now, companies like Penn Body offer a complete line of dump bodies that weigh only half as much as steel but with equivalent, or better, stiffness and impact resistance.

To make the bodies, Penn Body first butt-welds the floor from two sheets of 5154 alloy. Cross bracing is then added by skip-welding extruded beams of 6061-T6 alloy. Longitudinal members are welded in position and the sides and front, press braked from 5154 sheets, are welded in place.

Alcoa is headquarters for fresh, exciting ideas on how to weld, braze or solder aluminum. Get in touch with us. Where? See information at right.

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Your Guide to the Best in Aluminum Value

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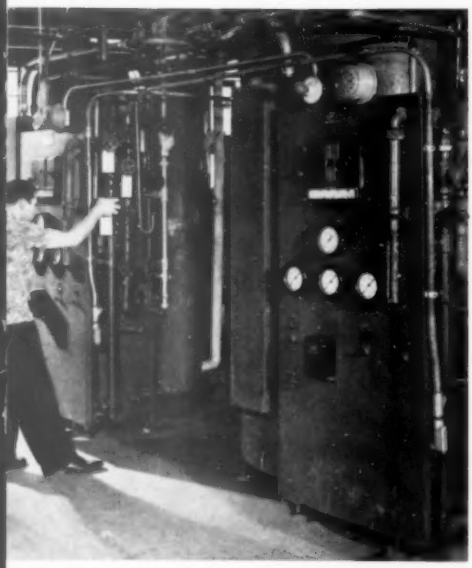
Oxides are avoided and decarburization is prevented when brazing is done in controlled atmosphere furnace. Key to operation is protective atmosphere.

Protective Atmosphere Eliminates Oxides

A PIONEER in the use of controlled atmosphere furnace brazing operations, Salkover Metal Processing of Illinois makes wide use of hydrogen gas to protect stainless, alloy steel and dissimilar metal assemblies. Use of this protective hydrogen cover during furnace brazing avoids formation of oxides on stainless steel and other parts processed and also prevents decarburization of steel of almost any composition.

Actually, the protective atmosphere used by the company is made up of 75 percent hydrogen and 25 percent nitrogen. It is formed by "dissociating" ammonia. This dissociating process has proved to be one of the least expensive and most efficient means of getting, pure, dry hydrogen for use in furnace brazing and bright annealing.

The shielding atmosphere is formed by passing anhydrous ammonia (NH_3) through a dissociator and breaking it down into its component elements: hydrogen (H_2) and nitrogen (N_2). The ammonia passes through a heated Inconel retort containing a catalyst—usually nickel powder dispersed in an aluminum oxide carrier. Com-



Dissociator breaks down anhydrous ammonia into component elements.

s in Furnace Brazing

bined use of high temperatures and the catalyst break the ammonia down into two separate gases: hydrogen (75 percent) and nitrogen (25 percent).

Dissociate Gas at 1750°F

Minimum temperature for dissociation is about 1560°F, but a higher temperature, 1750°F, is used to eliminate any traces of undissociated ammonia gas. The latter can prevent easy flow of brazing alloys and can also cause nitriding, or surface hardening, in assemblies being brazed.

Resulting gases are very pure. They are also very dry, having a minus 65°C dewpoint in the dissociator and a minus 40°C in the furnace.

After dissociation, gases are piped to the furnace under a pressure of about 5 psi.

The A-type mesh belt continuous furnace used is fully muffled. This means an Inconel muffle protects assemblies and shielding atmosphere from contamination during brazing operations.

Furnace is 55-feet long, has a door opening 20-inches wide by 10-inches high and is broken down into three major parts. The first two are the ascent and descent inclines which are each about 11-feet long. The third part is the connecting horizontal working section which is about 33-feet long. The horizontal section houses three major components: a 12-foot Inconel retort, an 8-foot heater chamber and a 20-foot water-jacketed cooling chamber.

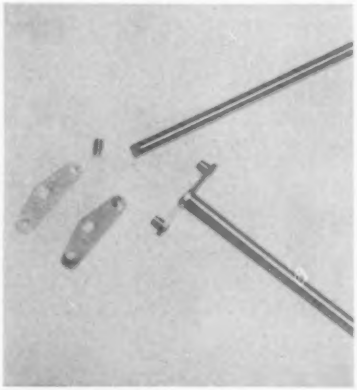
Prevent Hydrogen Dissipation

Use of inclined entrance and exit economizes on atmosphere. Placing the working horizontal section of the furnace slightly higher tends to keep the hydrogen in the furnace—since it is lighter than air—and prevents its dissipation.

A recent job done by Salkover is an example of the efficiencies of this type of brazing. The job was a shaft plate and pin assembly consisting of three different steel types. The assembly was brazed with no difficulty.

The company selected controlled atmosphere furnace brazing with hydrogen to prevent discoloration of parts and to eliminate oxidation. Actually, stainless steels cannot be furnace copper brazed without flux

Typical brazed assembly contains three different steels . .



Stainless, alloy and low carbon steel parts make up shaft plate and pin assembly which is brazed in controlled atmosphere furnace.

Air-operated press is used to press $\frac{3}{16}$-inch stainless rod and $\frac{1}{8}$-inch alloy steel pins into $\frac{1}{16}$-inch stamped low carbon steel plate.

Copper brazing paste is applied by brush to joint area. Experienced operator carefully gauges amount of brazing paste applied.

Loaded on screens in box-type trays, assemblies start trip through A-type mesh belt furnace. Production is about 3000 units per hour.

Produce 3,000 brazed assemblies per hour . . .

in customary endothermic or exothermic atmospheres because those atmospheres do not prevent formation of chromium oxide on high chromium steels. The firm also feels the process is speedier than any other brazing or joining method, gives stronger joints and eliminates warping and post-brazing cleaning problems.

Assembly consists of a $\frac{3}{16}$-inch diameter stainless steel rod and two $\frac{1}{8}$-inch diameter alloy steel pins which are pressed into and brazed to a $\frac{1}{16}$-inch thick stamped low carbon steel plate.

Here's How It's Done

First of all, pins and shafts are pressed into the stamped shaft plate in an air-operated press. Copper brazing paste is then applied by brush to the joint area. Paste is actually made up of copper powder particles suspended in a binder solution. Amount of alloy is carefully applied. Exact amount is gauged visually by operator who relies on experience with similar jobs to get proper amounts.

Assembled parts are positioned on screens in box-type trays. Care is taken in positioning parts so that they do not braze to each other or to any part of the tray. Trays are then placed on the mesh belt which travels at a medium rate of speed —about 45 feet per hour.

As tray goes up incline and enters furnace, parts are gradually heated. This is actually a sort of preheating operation.

Alloy Flows at 2050°F

When parts reach horizontal section of furnace and enter retort, they have just about reached brazing temperature at 2050°F. When parts have been held at this temperature for about five minutes, copper brazing paste begins to flow and by capillary action brazed joints are completed.

Shortly after brazing has taken place—in retort and heating chamber—trays enter water-jacketed cooling chamber where they are cooled gradually. Temperature differential here is more abrupt than in any part of the brazing operation, but is not enough to cause distortion or structural changes.

When trays emerge from furnace, pieces are cool enough to be handled with the bare hand.

Braze 3000 Units Per Hour

Production on this job is about 3000 units per hour. Each complete brazing cycle requires about 1½ hours, but speed of travel through the continuous furnace is adjustable and is varied in accordance with weights and cross sections of parts processed.

Internationally known for their advanced work in electric furnace copper brazing and bright annealing, Salkover has just moved into new and larger quarters in Franklin Park, Illinois. Included in the suburban Chicago plant are nine furnaces. One is used for hydrogen atmosphere brazing of stainless and alloy steels; one is used for furnace brazing of aluminum. The remaining seven are used for copper brazing and bright annealing of steels other than stainless, and for silver brazing and bright annealing brass and bronze parts.

For Valuable Reference Material Available At No Charge See Page 32

The variables which must be controlled in consumable electrode inert arc welding often can mean the difference between good and bad welding. Written by an expert, here is an authoritative discussion on the merits of two of the most important variables . . .

Constant Arc Length

Constant Arc Voltage

for consumable electrode welding

by ROGER W. TUTHILL,
Welding Dept., General Electric Co.

WHY does a great deal of misunderstanding exist about the prime variables which are necessary to control in the gas-shielded consumable-electrode arc welding process? Let's discuss the welding principles before answering this question. Most people will agree that, for good welding, a uniform, constant, non - varying welding current is necessary. This is easily attained if a constant wire feeding speed is used because, with the very high current densities employed in this process (amperes per square inch of electrode cross section) the burn-off rate of the electrode is controlled by the current.

In conventional metal arc welding—for example, when using flux covered stick electrodes—both the current and the arc voltage control the consumption of the electrode. In gas-shielded consumable-electrode arc welding, however, the arc voltage has very little effect in changing the burn-off rate. For instance, 410 amperes is needed to consume a 1/16" steel electrode feeding at 336"/min., in carbon dioxide, either at a short arc (28 volts) or a long arc (38 volts). A like situation exists for inert gases and other metals.

Since the burn-off rate and wire feeding speed must be equal for

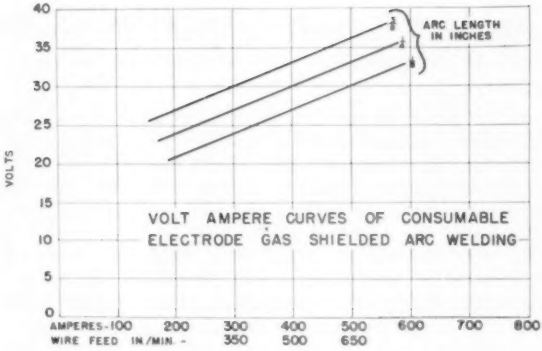

ARC LENGTH IN INCHES
VOLTS
VOLT AMPERE CURVES OF CONSUMABLE ELECTRODE GAS SHIELDED ARC WELDING
AMPERES-100 200 300 400 500 600 700 800
WIRE FEED IN/MIN. - 350 500 650

FIGURE 1. Typical volt-ampere curves show that as current is increased by increasing feeding speed, arc voltage also increases along a curve of constant arc length.

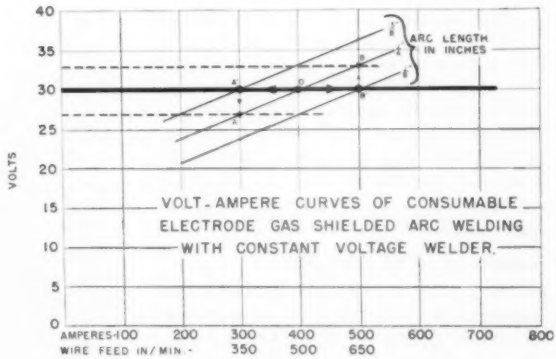

ARC LENGTH IN INCHES
VOLTS
VOLT-AMPERE CURVES OF CONSUMABLE ELECTRODE GAS SHIELDED ARC WELDING WITH CONSTANT VOLTAGE WELDER
AMPERES-100 200 300 400 500 600 700 800
WIRE FEED IN/MIN. - 350 500 650

FIGURE 2. With a constant voltage welder, trial and error voltage adjustment is required to obtain optimum arc length.

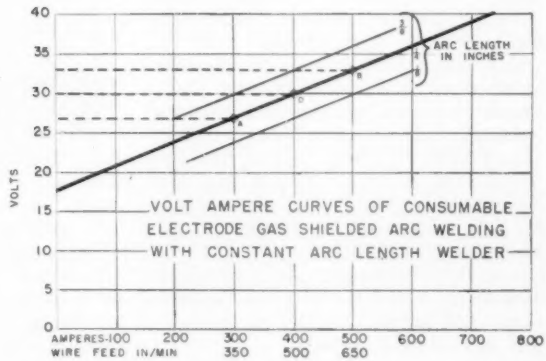

ARC LENGTH IN INCHES
VOLTS
VOLT AMPERE CURVES OF CONSUMABLE ELECTRODE GAS SHIELDED ARC WELDING WITH CONSTANT ARC LENGTH WELDER
AMPERES-100 200 300 400 500 600 700 800
WIRE FEED IN/MIN 350 500 650

FIGURE 3. Increasing feeding speed of constant arc length welder automatically increases voltage to the right value without additional adjustment.

stable welding conditions, the wire feeding speed setting predetermines the current that must be delivered by the power source. If the wire feeding speed adjustment controls the current delivered by the welder, then what does the adjustment of the welder do in the welding system? The adjustment of the welding machine can only determine arc length (arc voltage). Varying the controls on the welding machine does not and cannot adjust welding current.

The above principles are present because of high current density employed (40,000 amperes/sq. in. or more). So far, we have no reference to special welding machines. All of the above factors and principles apply to any direct current welder of any type which is used in high current density, gas-shielded arc welding.

Look at Arc Length

Now, let's take a look at arc length. In welding, this most important variable, arc length, controls penetration, bead contour, weld quality, porosity, undercut, spatter and general bead appearance. In manual welding, with flux-covered electrodes, the welding operator soon learns that he must coordinate his hand feeding motion so that he feeds the electrode at a rate necessary to hold a constant arc length. This variable, along with current setting on the welder, is used to insure uniform repetitive results. If you ask a welding operator what arc voltage he is using, he normally will not know and really doesn't need to know. As long as he holds a constant arc length, he knows he will get his desired results.

The same is true in high current density gas-shielded arc welding. But now the current is controlled by the speed of the wire feeding mechanism and control of the welding machine varies arc length by adjusting arc voltage.

It is necessary to know the arc voltage and current characteristic in high current density gas-shielded arc welding in order to fully evaluate these factors.

Electrical Characteristics

Figure 1 shows the electrical characteristics of a typical set of curves for the arc in this process. Note that, as the current is increased by increasing the feeding speed, the arc voltage also increases along a curve of constant arc length. The rising slope, typical of these curves, has been verified by several investigations.

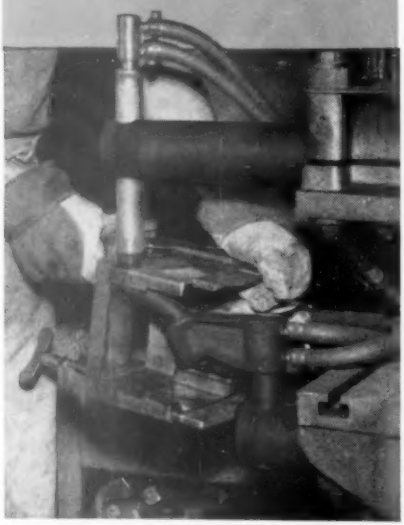
Figure 2 shows a power source which produces true constant voltage superposed on the arc curves from Figure 1. Figure 3 shows a power source which increases its voltage as the current output increases, the increase being just enough so that the voltage, in each case, is just the right amount to produce a constant arc length.

Compare Two Power Sources

Now let us compare the two types of power sources—constant arc voltage and constant arc length — under changing conditions. It is quite apparent that, if the current (wire feeding speed rate) remains the same, each machine will hold at a constant arc voltage and arc length point "O" on Figure 2 and Figure 3. The constant voltage machine in Figure

Welding Output Increased

on Western Electric Coin Box Production



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Arc voltage is convenient tool for measuring arc length

2 will have 30 volts whether welding or not. The constant arc length machine will operate at about 18 volts when not welding and this voltage will increase to 30 volts while welding. Each machine will hold the same voltage and arc length—400 amperes, 500"/min. wire feeding speed, ¼" arc length. Now let us change the wire feeding speed. Now we can see the differences between the two machines. We can either change the wire feeding speed while welding or stop welding to make the change. It makes little difference. Let us elect to increase the wire feeding speed from 500"/min. to 650"/min. while welding.

Still referring to Figure 2, we see that we will get 500 amperes at 30 volts at B^1. These conditions will result in a shorter arc, ⅛" long, causing serious changes in the above items effected by arc length. In this case, to maintain constant arc length, it is necessary to readjust the welder by trial and error till, finally, point B is reached by adjusting the arc voltage to about 33 volts.

Use Trial and Error System

Still referring to Figure 2, let us decrease the wire feeding speed from the original conditions to 300 amperes, 350"/min. We see we will get these conditions at point A^1, still at 30 volts. This produces too long an arc; thus, penetration and weld quality suffer. We may also run the danger of burn-back to the gun tip with resultant damage to the gun. Here again it is necessary by trial and error to find the proper setting for the welder (in this case, about 27 volts) which will maintain the same arc length as before the change in speed.

Now, let us see what the constant arc length welder does under the same conditions. Referring to Figure 3 for the above conditions, we see that when we increased the feed and current or decreased the feed and current, the output voltage of the welder automatically changed to exactly the right value and the welding machine did not have to be adjusted but automatically compensated for the new set of conditions.

Some Weld at One Setting

Many people may say that they will be welding at only one setting, particularly if the job is fully automatic, and so either machine would do a good job and hold both arc voltage and arc length constant.

This is so; but many jobs, particularly automatic ones, are making increasing use of crater filling circuits. Crater filling is done by reducing the feeding speed and, hence, the current at the end of the weld. This tapering of current, with the travel speed stopped, fills up the end crater normally found which would otherwise be a source of stress concentration and cracks.

From the above considerations, it can readily be seen that, during the crater filling cycle, the requirements of the arc call for a reduced voltage for the same arc length and this cannot be obtained from the constant voltage machines.

Summary

In summary then, arc voltage in gas-shielded consumable-electrode

(Continued on Page 86)

Allis-Chalmers and A. O. Smith cooperate . . .

Develop Semi-Universal difficult welds

Cylindrical tubular frame provides greater resistance to twisting.

Here's how A. O. Smith's welding experience and research facilities helped Allis-Chalmers get the right electrode (SW-29) to end a complicated welding problem.

WHEN a motor grader goes to work, its forward frame absorbs terrific shocks and stresses. To minimize this effect, make their motor grader even better, Allis-Chalmers brought forth a daring departure in design — the tubular frame. Performance-wise, it proved its superiority. Its success, however, was dependent on consistent high quality welds, made under very difficult conditions.

To make these difficult welds on the tubular frame along with the majority of the welds on the entire motor grader, Allis-Chalmers needed an

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In traveling and working over rough terrain like this, the Allis-Chalmers FORTY FIVE Motor Grader subjects most welds to repeated shocks and heavy torsional stresses. To protect the machine's performance, A. O. Smith welding electrodes are used.

E-6012 Electrode for on new motor grader

E-6012 electrode that would perform equally well on many gauges of metals, be easy to use out-of-position, minimize spatter and have a high degree of welder acceptance.

So Allis-Chalmers called in A. O. Smith. After intensive research, experimentation and close cooperation with Allis-Chalmers — A. O. Smith came up with the SW-29. It met all qualifications.

What's your welding problem? Why not contact your "man from A. O. Smith" . . . take advantage of A. O. Smith experience and facilities to solve it.

The man from A. O. Smith . . . *Hal Costello* is the A. O. Smith welding consultant who worked with Allis-Chalmers. More than a salesman, he's a welding specialist, ready and eager to help with any welding problems.

Through research . . . a better way

A.O.Smith
CORPORATION
WELDING PRODUCTS DIVISION
Milwaukee 1, Wisconsin
International Division: Milwaukee 1, Wisconsin

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By applying skills and materials used in industrial applications, welding operators are coming up with interesting and attractive art forms. That's why we can consider . . .

Welding as an Art as well as a Science

SCULPTURE, one of the oldest forms of art, has always clung to the conventional. It has used the same tools, with slight modifications, and the same materials for many generations. Now, a significant change has taken place. Materials and methods of the present are being used, and the result fits into our modern environment.

This is an age of steel and iron and a new technique has evolved in working with these and many other metals. Instead of casting, with all the skill and expense involved, an all-welded design is possible by using suitable alloys and techniques.

In industry today there are thousands of highly qualified welding operators who possess the knowledge and skill required for this new sculpture. A man who can rebuild a broken tooth on a gear wheel and shape it to required dimensions with the flame of an oxy-acetylene torch, is already a sculptor.

David Smith, who worked for 2 years during the war as an electric

"Specter Riding A Headless Horse" (left) is made up of welded steel plate and chain. Simple welded design (right) combines utility and beauty.

welding operator at the American Locomotive Works, is now regarded as one of the coming American artists. His work is priced from $150 to $1200 and up and his development can be traced by the characters he portrays in metal and the form they take. Smith has developed into an exponent of abstract art. He deals with essentials. He picks these out and reassembles them in metal. A writer for a digest magazine operates the same way. He reduces a full length book, or article, to a few pages by eliminating everything except the essentials.

Welding skill is the chief requisite of the amateur sculptor. The equipment consists of an oxy-acetylene or arc welding torch, a supply of welding alloys and the base metal for the foundation.

Copy Other Designs First

It is usually best to copy before attempting to create. Then, when proficiency is attained, improvements in design will follow and finally, ideas will be translated into metal.

One operator who specialized in silhouettes, used bronze rods of various diameters to outline face and features. They were heated and shaped to the desired contours before joining. A particular alloy was used throughout because of its low bonding temperature (1000° to 1200° F.) and its exceptional wetting characteristics. This was a question of bonding the sections rather than building them up with weld metal. Bond strength was necessary, but even more essential was an alloy which could be applied without warping and distorting the small diameter rods.

The finished effect was excellent and resembled a penciled drawing. Dexterity increased until figures,

views and buildings could be fabricated and all the materials used were welding rods and a welding alloy with its complementing flux, to join them.

Sculpture is associated in most people's minds with large pieces of material which are chiseled or carved to produce the final statue. This is a technique of removal. The unwanted material is chiseled away. The welding technique is directly opposite. Material is added piece by piece or bead by bead until the desired effect has been obtained.

This permits the operator to make use of scrap material and add piece by piece until the desired effect has been obtained. Pieces of scrap, from which portions have been blanked, when welded to lengths of square stock make striking pieces for outdoor use.

The welding artist can depict the stark reality of life with materials which are associated in his mind with such conditions. Chains, iron bars and twisted metal are used to indicate fetters, loss of liberty and chaos.

Color plays as important a part in the appearance of welded sculpture as it does in the color matching of weld deposits for industrial use. A contrast, a perfect color match or a particular color can be obtained by selecting the correct alloy. Colors ranging from deep copper to light yellow are possible. This permits some very beautiful effects to be realized.

Metal spraying and burnishing heighten the effect. Steel is sometimes sprayed with zinc to prevent corrosion. If followed by a copper spray a silver and pink color is produced.

Indoor pieces may be treated with specially prepared waxes, or lacquers. This latter method permits the most colorful effects to be produced because the number of colors obtainable in lacquer is practically unlimited. The hard baking lacquers, or enamels, give a durable wear resisting finish, but care must be taken to remove all flux from the welds or the coating will peel.

Rust itself can convey a colorful impression on pieces which lend themselves to this treatment and the hard metallic appearance of steel and iron may be softened by the blending of rusts, blacks, greys and silvers.

What Materials to Use

Theoretically, if a metal can be welded it is suitable for welded sculpture. In practice, however, composition of the metal must be considered, its melting point and the type of work to be performed.

If the work is primarily of a joining nature where the various pieces are welded together to form a whole, the melting point of the parent metal is of less importance than the selection of a suitable joining alloy. An alloy can be used which has a melting point hundreds of degrees below that of the parent metal. This will eliminate the danger of over-heating, or melting the parent metal.

An elementary knowledge of metallurgy is, of course, essential to anyone working in this field, but an experienced operator already possesses this knowledge. Cast iron is a poor conductor of heat and care must be exercised to prevent local heat build-up which would set up contractual stresses. The use of a low melting

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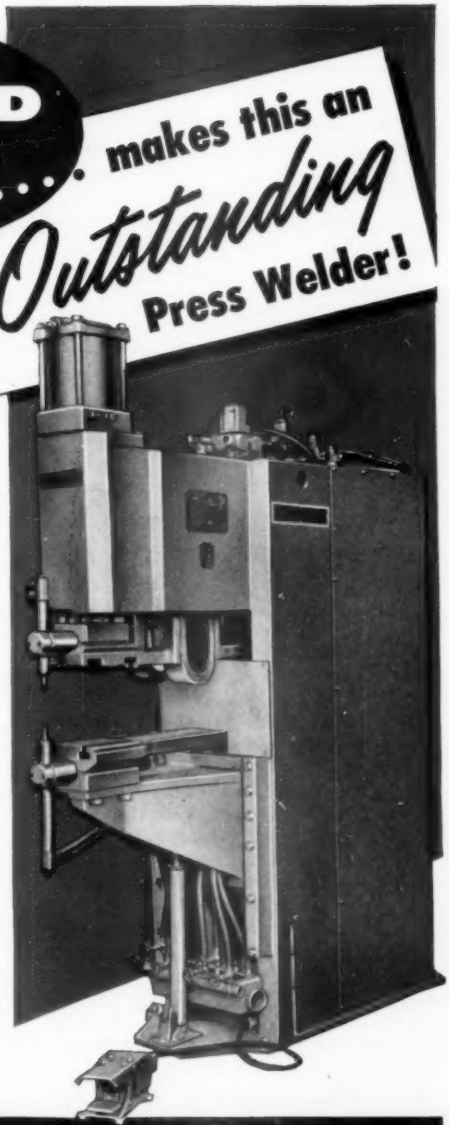

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point alloy will reduce this danger and there are various welding techniques which may be used to minimize local over-heating.

Temperature Indicators are Used

The effect is entirely opposite when aluminum is heated. Aluminum has a very high thermal conductivity. It conducts the heat away from the flame so rapidly that it is difficult, sometimes, to attain the necessary bonding temperature when large areas are involved. Unlike steel or iron, aluminum does not show heat color. It is difficult, therefore, to determine temperature of the metal with any degree of accuracy. The introduction of temperature indicating materials (pellets, paints, crayons, fluxes) has simplified the bonding of aluminum to such an extent that it is practically fool-proof.

When assembling an object made from aluminum pieces of various sizes and thicknesses, neatness and beauty should be the objectives. Unsightly welds would be objectionable, so a thin flowing alloy should be used. In addition, the alloy should have excellent wetting properties and flow smoothly through the joints to form neat fillets, resulting in a minimum amount of finishing and an effect of solidarity, each joint blending with the metal it joins. Of course, inert arc welding would also be an excellent method of achieving these results.

Heat Flux Carefully

Flux is applied to the joint area and the metal in the immediate vicinity broadly heated with the flame of an oxy-acetylene torch. The flame should not be directed upon the flux itself. This would liquefy the flux before the metal had reached bonding temperature. The metal should conduct the heat to the flux so that when the flux melts it is a definite sign that the metal in the weld area has reached approximate bonding temperature. When the flux starts to flow out, the tip of the rod should be touched to the joint. A small bead will adhere to the joint and if heating is continued, with the torch in constant motion, the bead will suddenly spread around and through the joint. When it appears on the opposite side, the joint is completed and the heat may be discontinued.

The same technique, with slight modifications, is used with all thin flowing alloys. Each will give similar results if used on the metal for which it is formulated.

When dissimilar metals are involved a compromise is necessary. The alloys selected must give the best results possible on both metals.

The type of sculpture which requires highest quality of manipulative skill is that where contours have to be shaped with the flame of a torch.

How to Use Arc Welding

A building-up process which has produced many highly decorative objects can be done with the electric arc. Strips of steel are bonded to lengths of bar stock to form scrolls and further ornamentation is provided with ornamental wrought iron.

This is where the skill of the operator is combined with that of the craftsman in iron. The modern trend back to ornamental iron

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A new all-CO_2 gas process by Liquid Carbonic saves approximately 7¢ on every foot of shielding gas used. Expensive argon or helium are entirely replaced by low-cost CO_2 in metal-arc gas shielded welding of carbon steels.

High quality, high speed welds. The new Liquid Carbonic all-CO_2 MAGS process (metal-arc gas shielded welding) produces welds which are equal or superior in both speed and quality to welds made with argon or helium shielding.

Adaptable to both hand and automatic equipment. Your present equipment can probably be used, either "as is" or with modifications. There is no extensive "change over" period with the new Liquid Carbonic all-CO_2 MAGS welding process.

Low cost multiplies the possibilities for shielded gas welding. By greatly reducing shielding gas costs, Liquid Carbonic's all-CO_2 process makes the many advantages of shielded gas welding available for even "low budget" applications.

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Welding a pulley with Liquid Carbonic's new all-CO_2 MAGS process. In addition to cutting welding costs, new process virtually eliminates warpage because of reduced heat input.

Complete technical and operating data on this new welding process is available. For your free copy of Liquid Carbonic's fact-filled new booklet on all-CO_2 metal-arc gas shielded welding, simply mail the coupon below.

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work has brought together the beauty of the past with the latest techniques of today.

Some of the designs are faithfully copied from the oldest iron work known to man and welded joints must blend into the assembly without jeopardizing the authenticity of the pattern.

Problems arose when arc welding was first introduced into this craft. A perfect color match was essential in some operations so an electrode had to have this property in addition to the other characteristics needed to bond similar or dissimilar metals.

Excessive heat in itself constituted a major problem. Iron, with its low thermal conductivity, is subject to heat cracks caused by uneven expansion and contraction. The high operational heat of conventional electrodes could cause a high percentage of rejects due to this cause. A range of special purpose electrodes proved ideal for these operations because of their low amperage requirements. The heat input was reduced to a minimum and it was possible to maintain a short arc which reduced the danger of burn-through, embrittlement and distortion.

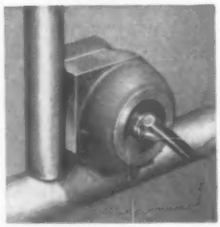
Clean-up Takes Time

Another factor was the time consuming clean-up operation. A section could be welded with a conventional electrode in half an hour, but a further 2½ hours was needed to clean up the area after welding.

Eye appeal is an important factor in ornamental iron work. This may necessitate a final machining operation. The weld deposits, therefore, must be fully machinable.

Strength is the keynote of many of the designs. The slender sup-

pays for itself in a week



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porting arms of an object may rely upon their seeming fragility for their beauty. They often have to support considerable weight so the weld must have exceptionally high strength where it joins the arm to the base and where it joins the part supported.

Consider Corrosion

Many of these grilles and ornamental work are situated outdoors in highly corrosive atmospheres. This necessitates a protective coating to prevent rust. The adhesion of paint and the like depends entirely upon a chemically clean surface. Paint will peel from any sculpture where slag inclusions exist or where flux residues remain. Electrodes used must produce clean, slag proof joints so that flux can be removed easily and rapidly.

A new and realistic approach to art, through welded sculpture, may arise through the efforts of practical men. Operators possess the skill and knowledge of metals. They are used to working to close tolerances so it remains to be seen if the art of welding is to be carried one stage further and the welding operator become recognized as the artist he really is.

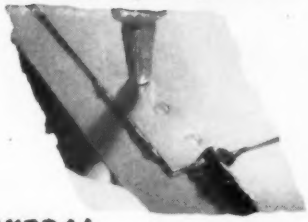
Photos and data from Eutectic Welding Alloys Corp.

Heads Development at Harris Calorific

Dana H. Bailey has been named Director of New Products Process Development by Harris Calorific Co., Cleveland, Ohio, manufacturer of oxy-acetylene welding and cutting equipment.

WATER-TIGHT ... CORROSION-FREE SEAMS with

PARWELD SPOTWELD SEALER



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The sturdy Taylor Velocipede frame of 2-inch mild steel tubing is braze-welded on this fixture, with ⅛-inch Anaconda-997 (Low Fuming) Bronze Welding Rod, using the oxyacetylene flame-fluxing process.

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The sturdy Taylor Velocipede frame of 2-inch mild steel tubing is braze-welded on this fixture, with ⅛-inch Anaconda-997 (Low Fuming) Bronze Welding Rod, using the oxyacetylene flame-fluxing process.

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"Braze Welding with Anaconda 997 (Low Fuming) Bronze Welding Rod is the most practical method of joining steel tubing," The Frank F. Taylor Co.

The strategically placed braze welds on Taylor Velocipedes have smooth contours, a good basis for a fine finish—and high strength to stand up in the hardest service. The Frank F. Taylor Co. also makes the famous Taylor-Tot, standard equipment in most young families.

"By depositing smooth flowing and low fuming weld metal, Anaconda-997 (Low Fuming) Bronze Welding Rods promote faster, more uniform work—providing the quickest, most dependable, most economical method of joining steel tubing," says The Frank F. Taylor Company of Norwood, Ohio.

Anaconda 997 (Low Fuming) Bronze is a superior braze-welding rod widely used for the joining of steel, cast iron, and copper alloys by the oxyacetylene process. It is also used to deposit bearing surfaces on steel and iron. Anaconda Welding Rods are sold by distributors of welding equipment everywhere, such as O.K.I. Welding Company, Cincinnati, Ohio, which supplies The Frank F. Taylor Company.

See your Anaconda distributor for help in selecting the exact rod for your job. Or write for Publication B-13. Address: The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Company Ltd., New Toronto, Ont.

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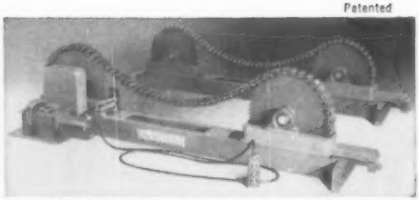

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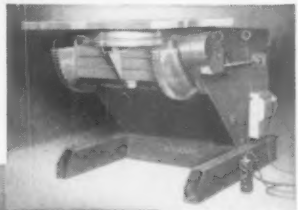

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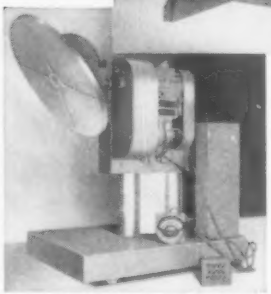

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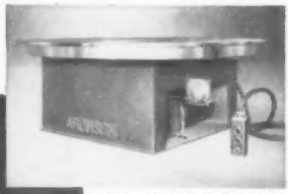

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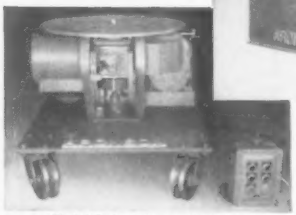

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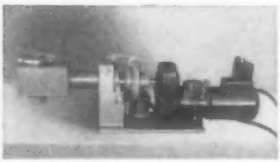

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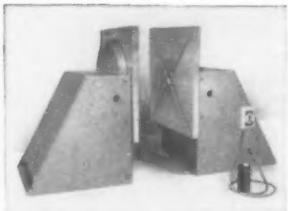

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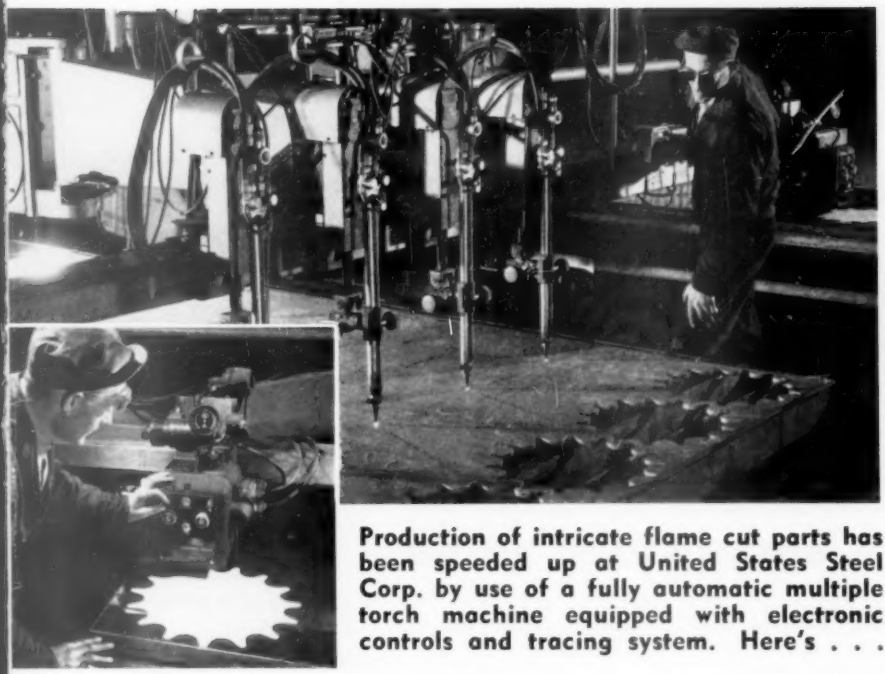


Production of intricate flame cut parts has been speeded up at United States Steel Corp. by use of a fully automatic multiple torch machine equipped with electronic controls and tracing system. Here's . . .

How Automatic Flame Cutting Speeds Steel Shape Delivery

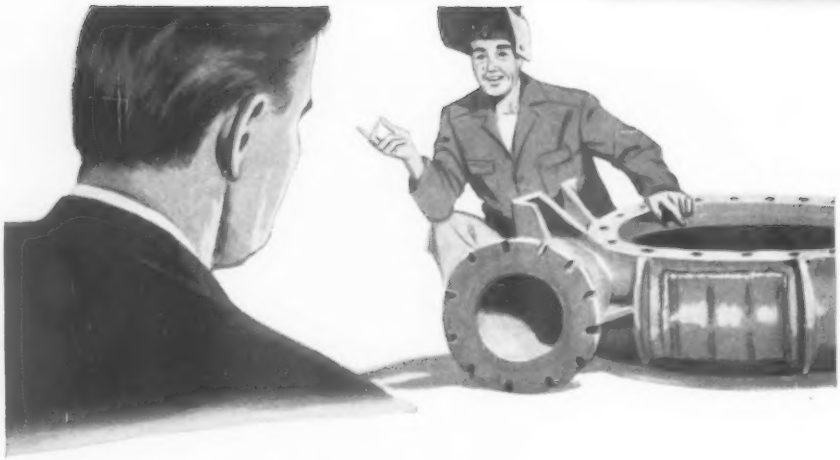
THE accuracy and efficiency of flame cutting operations have been greatly increased by the use of a multiple-torch machine with electronic controls at United States Steel Corporation, San Francisco, Calif.

It is being used by the company's steel supply division to cut shapes from materials up to 12′ wide, 42′ long, and 10″ thick.

Mounted on a motor-driven base, the cutting unit travels on steel rails and has oxy-acetylene torches rigidly mounted in such a way that its movements do not cause friction.

The torches can be adjusted to cut beveled edges as smoothly and accurately as perpendicular ones, and this makes it possible in many instances to cut steel pieces to such close dimensions that no further processing is required.

Tracing is automatically done by means of a phototube system which guides the flame-cutting torches along the outline of a drawing or paper cut-out by fol-



Nick finds out about welding underwater vacuum cleaners

'Nick,' says my boss, 'I certainly *hate* to see you suffering in the heat . . .' And he smiles at me.

(I'm getting ready to thank him, 'cause the day sure was a scorcher. Then he finishes his sentence.)

'. . . so I've figured out something *cooler* for you to do. Go out to the address on this paper . . . ask for a weldor named Leo . . . and learn something about *underwater vacuum cleaners.*' And he walks out laughing before I can say a word.

Clean rugs for lobsters

It turns out that Leo works for a dredging company. And he starts right off telling me about this cast iron casing for a dredge pump. It picks up sand and gravel from the ocean bottom—just like an underwater vacuum cleaner! Well, a couple of days before, a rock tore a big hole right through the two-inch thick casing.

'The casting cost $1,500,' Leo says, 'and I was sure I could save it. Yesterday I cut grooves in a steel plate. Formed it to fit over the hole. I welded the outside with four passes of Ni-Rod "55"* electrode. This morning I welded a smaller steel plate to the inside, and hard-surfaced it. The whole job took me only six hours.'

Welds outlast an impeller

'That's pretty good welding, isn't it?' asks Leo. It *was*, but I can see he doesn't want an answer or any other interruption.

'Some time back I did just as good,' he continues. 'Rocks broke about six inches off every vane on a $1,200 pump impeller . . . a special-alloy casting. So I welded steel sheet to each vane with Ni-Rod "55". And the vanes were *still* in good condition when the rest of the

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impeller wore out.'

'Just like I always tell the fellers,' I says, 'with Ni-Rod "55" you can expect good results in *all sorts* of cast iron welding . . . even in heavy sections like the pump casing . . . even when you weld dissimilar iron alloys, like on the impeller.'

Why we got treated

Just then *Leo's* boss walks in and sees that $1,500 pump casing *as good as new.* And didn't his face light up!

'Well,' says he, 'this calls for a celebration. Now that you've learned about underwater vacuum cleaners, I know *your boss would want us all to keep cool at the ballpark.* And thanks to Leo's quick talking, we still have time to go!'

Send for this handy guide

If you haven't written for "A Handy Guide to Welding Cast Irons," you're missing something good. It's a new illustrated booklet that gives you *many* valuable tips — on preparation, welding techniques, welding heavy sections, stress-relieving welds, and *lots* more. Send for your copy.

Yours for better welds,

Nick Rodder

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street, New York 5, N. Y.
*Reg. U. S. Pat. Off.

Circle No. 40 on Reader Service Card.

FLAME CUTTING . . .

(Continued from Page 73)

lowing the intersection of light and dark colored surfaces. Since their only purpose is to provide a white outline on a dark background, or vice-versa, the templates are quite inexpensive.

By producing the most intricate cuts with precision, the new machine greatly reduces the need for supplemental handling and machining operations and simultaneously minimizes the quantity of scrap that must be produced.

Company officials say it is being used to cut inside and outside square corners, obtuse and acute angles, long and slim projections, narrow slots and compound contours.

AUTOMATION IN WELDING

(Continued from Page 46)

best method for handling. Techniques employed for light, small parts could not be used for large, heavy parts, such as go into the weldments for tractor equipment.

This section can be divided into three sub-groups: (a) automated welding involving direct manual loading (and unloading), (b) automated welding by moving parts through the welder and (c) handling of heavy parts for welding.

Welding operations in the first group are automated to varying degrees, but are performed with direct manual loading. Those in the second group have been mechanized by moving the piece part through the welder to maximize the duty cycle of the welding equipment.

Handling Heavy Parts

Heavy parts are handled so

welding can be done in the downhand or flat position. This results in obtaining maximum possible manual arc welding speed with minimum of operator skill required.

Practically all of the Harvester Works having manual arc welding operations utilize welding positioners or fixtures to allow downhand welding to be used to the maximum extent.

Welding and Other Operations

Another principle of automation is the combination of two or more manufacturing operations, either into the same machine or by integrating several machines together. This principle is used quite extensively by the automotive and refrigeration industries, as well as by others where high production is involved.

However, the trend is toward the use of unitized assembly or production lines rather than completely integrated ones. By unitized, we mean separate machines tied together to provide automated assembly, but also capable of operating separately. Such a system tends to minimize the effect of machine breakdowns, which are very costly when they occur in completely integrated lines.

E. R. Joseph Company Holds Welding Show

Fifteen welding and cutting suppliers demonstrated their products at a three day welding show held recently by E. R. Joseph Co., Norristown, Penna. Close to 500 customers attended the show held in company's new 4000 square foot warehouse.

- **Heat and impact resistant moulded plastic insulators lengthen insulator life up to FOUR TIMES.**
- **NEW PUSH-BUTTON air valve, completely insulated and doesn't need to be held down.**
- **Glass laminate sleeve protects handle from burning.**
- **Moulded upper arm handle fits hand, makes torch fully insulated.**
- **Cable connection inside handle, moves cable flexure away from connection, increases cable life.**
- **Insulating rubber boot on connection to welding lead. Insulates connection and can be instantly opened for changing connection.**

• OUR NEW MODEL H-3 Arcair torch includes many engineering improvements as listed at left, plus a new ease of operation! It's shorter, more compact size makes it much easier to use in hard-to-get-at places, and it gives better quality work faster on all jobs. All of the basic operation features such as rotating head and concentric cable which have made the model G-3 so popular, have been retained.

As with all Models of the Arcair torch, the new model H-3 uses only an electric arc and ordinary compressed air, and works on all metals. It's even more simple to operate, and has the usual wide applications throughout all industries. Write for complete information TODAY, and ask for the new Arcair Bulletin No. 6-1.

Arcair Company, 429 S. Mt. Pleasant St., Lancaster, Ohio

Circle No. 12 on Reader Service Card.

N.W.S.A. Zones Meet

The first week in November was a busy one for the West Central and Western Zones of the National Welding Supply Association. On Monday and Tuesday, October 29 and 30, the West Central Zone met at the Hotel Nicollet in Minneapolis, Min. On the last two days of the week, Thursday and Friday, November 1 and 2, at the St. Francis in San Francisco.

Discuss Management Problems

West Central Vice President Mars and Director Toll arranged an effective program which featured management problems. Two panel discussions were featured. One covered basic financial problems, the other was on methods of selling to the construction industry.

Keen Interest in West

Vice President Stanfill reported unusually keen interest on the part of members at the Western Zone Meeting. Opening session featured a panel on how manufacturers can help distributors do a better merchandising job. Other sessions covered selling to construction industry and need for better financial statements.

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- structurally designed for extreme strength—outlasts ordinary connections 3 to 4 times.
- minimum resistance, minimum heating when locked, yet quick disconnect.
- easy to add to your present cables at lowest cost—in minutes, in your plant, in the field.

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For panel mounting—shockproof — prevent accidental short-circuiting —insures safe, instant cable connection to machine without tools.

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EMPIRE PRODUCTS INC.
P. O. BOX U-98, Cincinnati 36, Ohio

Circle No. 22 on Reader Service Card.

The rectifier type D. C. welding machine is used for all inert gas metal arc welding on nickel alloy pump components. Machine is equipped with a crater eliminator and is used at 60 amps during operation. Shielding gas is argon; tungsten electrode holder is ceramic type.

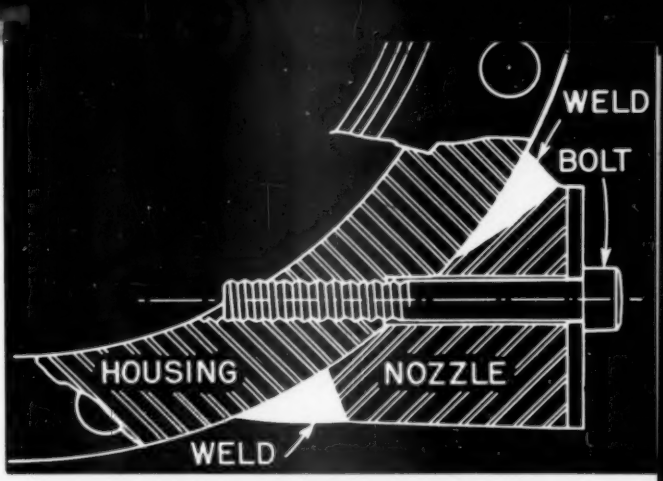
Use Multiple-Pass Welding Techniques to Join Nickel Alloy Components

***Inert* gas shielded arc welding with small diameter welding rod and multiple passes produces extremely sound and highly uniform welds required for Atomic Energy machinery components.**

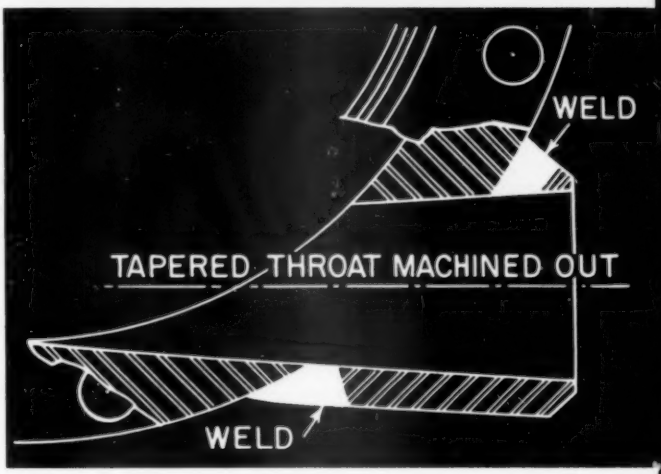
THE Atomic Energy Program, which has been progressing at an accelerated rate since World War II, has developed many new and unusual materials and techniques to meet the complex operating and service conditions involved — many never before encountered in industry. High temperature, excessive pressure and extremely corrosive conditions are some of the more common encountered.

To produce machinery and equipment that will operate reliably under these conditions it is often necessary to develop and utilize rather unusual variations of accepted or standard fabricating techniques.

An excellent example of this is



Special set-up and 40 passes with 3/32 - inch nickel alloy filler rod at 60 amps are used to weld typical assembly, a pump impeller housing. Welding speed is less than one inch per minute.



Weld metal must be of the same strength and ductility as the base metal to withstand high pressures. It forms a considerable part of the port after boring.

involved in the production of a specially designed centrifugal pump, made up of semi-finished nickel alloy components, and fabricated for the Atomic Energy Commission in the production welding shop at Elano Corporation, Xenia, Ohio.

Since this pump operates under an extremely high pressure and handles fluids as hot as 1800°F and extremely corrosive, it is made of a special nickel alloy. The complete pump consists of about 20 separate parts welded at different points. The pump body measures about 16 inches in diameter. For average production welding operations, the nickel alloys possess similar characteristics to those of low carbon steel and therefore can be welded by the fusion arc or oxy-acetylene torch methods.

To assure the production of an absolutely sound, pore-free weld, which is an absolute necessity for the pressure-temperature application involved, inert gas, shielded

Ten Steps for Welding Nickel Alloy Assemblies

1. Vapor degrease all parts.
2. Rinse in carbon tetrachloride.
3. Remove excess base metal. No abrasives — clean out with stainless steel wire brush only.
4. Set up (handle with clean gloves).
5. Lay down a straight bead.
6. Inspect by penetrant dye method.
7. Cut back each weld bead to sound metal.
8. Repeat passes and inspection procedure on each bead until sufficient sound metal has been built up.
9. Heat treatment in helium and hydrogen atmosphere at 1500°F.
10. Inspect and pressure test.

arc welding is used exclusively. Argon which is 99.8 percent pure is utilized as the shielding gas because of its heavier atomic weight and better shielding action at a lower heat input. This gas not only produces a smooth quiet arc but also minimizes erosion of the tungsten electrode and eliminates porosity in the weld metal.

Since nickel alloy weld metal does not spread or flow as much as mild and low alloy weld metal, and the penetration is not as deep, excessive heat input had to be avoided to prevent serious residual deoxidizer loss. For this reason, joint design and welding technique had to be of the type requiring low heat input, in this case about 60 amps even for weld sections up to 2 inches.

Combining the shallow penetration and characteristics of nickel alloy weld metal with the desirability of lower weld temperatures, it was found that multiple passes using 3/32 inch diameter rod would be required. A typical joint, welding the outlet port to the impeller housing requires approximately 40 passes to build up a concentration of weld metal 2 inches through its heaviest section. Contrary to accepted practice, a straight type bead is laid down. The usual weaving motion is not used as it deposits too much metal and thus encourages detrimental puddling. A dipping action is used with the weld rod dipped into the parent metal as it becomes molten.

Uniform Weld Structure Obtained

The multiple pass, narrow bead technique achieves a minimum temperature which results in only slight grain growth in the fringe area of parent metal. It also produces a uniform structure in the weld metal as it builds up. The end result is a strong, ductile and sound weld approaching the maximum physical characteristics attainable with cold drawn nickel alloy rod. It also assures maximum corrosion resistance in the weld area, resistance equal to that of the parent metal.

Nickel and high-nickel alloys are highly susceptible to embrittlement as welding temperature by

When one welder IDEALARC . . .

Has the smoothest, steadiest arc AC and DC . . .

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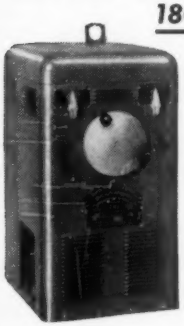
180 amp to 500 amp



300, 400, 500, amp sizes.
Heavy-duty industrial models for production and fabrication with AC or DC welding current. Full 300, 400, 500 amp DC ratings. Write for Bulletin SB-1343.

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DC as well as AC welding for the shop with only single phase current. Ideal for production and maintenance. Write for Bulletin SB-1364.

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- Both AC and DC are needed . . . for highest speed . . . for lowest welding cost.
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- You can buy Idealarc as a straight AC welder to which you can add DC at any time.

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Dept. 1822, Cleveland 17, Ohio
The World's Largest Manufacturer of Arc Welding Equipment

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DO PRECISION WELDING IN YOUR SHOP!

Enter the growing field of precision welding. It can offer a savings over other methods of assembly . . . broaden the scope of your operation . . . cut costs . . . increase profits. The ideal unit for this type work is the Challenge Precision Welding Table. It's suitable for accurate layout work, "tack" welding and final welding operations. It's equipped with T-slots to permit accurate positioning and holding of the work. Made of a special analysis semi-steel, designed to withstand the welding flame or arc. Guaranteed accurate to within .002". Available in three sizes.

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IW-12

The Challenge Machinery Co.
Grand Haven, Michigan

Please send complete information on Challenge Welding Tables and other Precision Surface Equipment.

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such materials as lead, sulfur, phosphorus, and other low melting alloys and metals which are often present around the shop. Grease, oil, paint, lubricants, fingerprints, perspiration, etc., will also cause trouble unless removed.

To remove these foreign materials, each part is vapor degreased and given a carbon tetrachloride rinse before set up. Gloves are worn at all times during handling.

Avoid Abrasives

If any metal has to be removed in the joint area, before or during welding, it is machined or a file or rotary burr is used—*no abrasives*. The resulting chips or filings are immediately removed by stainless steel wire brush.

To further insure the best joints, all welds are made in the downhand position with the electrode at an incline of about 20° degrees from the vertical. The bare rod which is hand fed from the other direction by the operator is held at a slight angle and carefully drawn straight along the joint to produce a straight bead. The ideal average welding speed at 60 amps is less than one inch per minute. DC rectifier type welding machine, which is used for this work, is equipped with a crater eliminator that automatically reduces the current and voltage at the end of each pass. This prevents the formation of a crater and provides an excellent condition for the restrike. By using a copper striking block, the possibility of breaking a tungsten tip which might drop into the weld area and contaminate it, is minimized.

Soundness of Each Bead Checked

After each bead is laid down, it is carefully checked for soundness by the liquid penetrant dye method. When voids or imperfections

are detected by the developer fluid the bead is cut back by a rotary burr until subsequent dye checks reveal sound metal. At no time is an abrasive of any type used in the welding process of these components. All dye material is carefully removed before the next pass.

To meet the specifications dictated by service life requirements, a stabilization heat treatment at 1500°F is given to each part. To protect the metal surface and also retain maximum corrosion resistance, an atmosphere of helium and hydrogen is used throughout the 40 hour cycle. Hot worked nickel alloys require this stress relief to develop the best combination of strength and ductility and also to insure against any distortion and warping during subsequent machining.

After final machining some welded assemblies are tested for leakage using a leak detector with the parts heated to 250°F while under an internal pressure of Freon gas at 5 psi.

Cleveland Meeting on Resistance Welding

"Resistance Welding Fundamentals, Applications and Future" is the title of a talk to be given at the December 12th meeting of the Cleveland Section of the American Welding Society. Speaker will be J. F. Cantalin, supervisor of production engineering, Fisher Body Division of General Motors, Detroit.

Mr. Cantalin's talk will be followed by resistance welding panel which will answer audience questions. Moderator will be Prof. R. C. McMaster of Welding Engineering School, Ohio State University.

When heavy, unwieldy weldments like these diesel crank cases can be quickly swung into any position so that every weld is made downhand — that's efficient welding!

Welders spend more time welding — do better welding at lower cost when they work with C-F Positioners because these hand and/or power operated machines reduce positioning time to a minimum. Investigate the cost-saving advantages of C-F Positioners. They pay their way in any company.

Write for Bulletin WP26 —an illustrated circular detailing the Specific advantages of C-F Positioners.

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C-F positioned welds mean better, more economical welds

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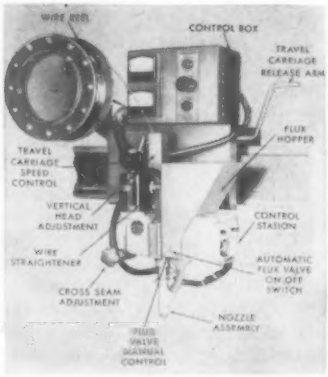
When a line of automatic welders for DC and AC operation

Has the most sensitive controls for fast starting and uniform welds

Yet is easiest to adapt to any fixture

WHY

buy anything but LINCOLNWELD for automatic welding



New automatic LINCOLNWELD simplifies tooling

...increases production dependability

LAF-3 Lincolnweld for DC welding
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Universal, foolproof controls give you . . .

- **dependable starting . . . uniform quality welds**
- **cold starts or hot starts**
- **controllable inching speed**
- **simple accurate positioning**
- **integral or remote controls**

WRITE FOR Bulletin SB-1355 for complete specifications.

Longitudinal Welds *made at low cost on automobile rear end housings with LAF-3 Lincolnweld and simple fixture.*

Circular Welds *in welding cover to back face of banjo.*

THE LINCOLN ELECTRIC COMPANY
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LINCOLN . . . *one dependable source for all your arc welding needs—welders • power sources • fluxes • electrodes • application engineering.*

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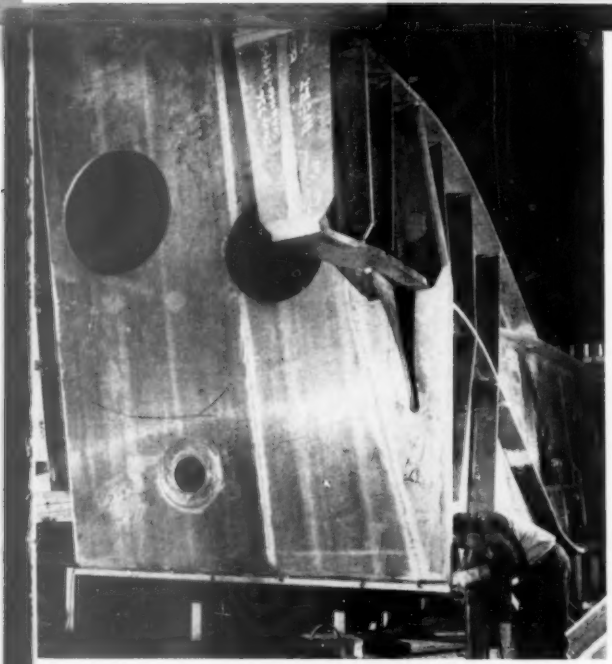

Consumable electrode inert arc welding is used to fabricate all - aluminum, all-welded aircraft carrier elevator. Plate thickness ranges from ¼ to 2-inches.

Inert Arc Used on World's Largest All-Welded Aluminum Structure

THE recently christened attack carrier U.S.S. Ranger will put to sea with more aluminum aboard than any of the world's fighting ships.

When finally fitted out by Newport News Shipbuilding and Dry Dock Company, the mighty vessel will take advantage of more than two million pounds of the light metal. The new Forrestal-class carrier also features the first all-aluminum deck-edge elevator to be installed aboard the 59,900-ton vessels.

The huge welded structure, largest ever built of aluminum in the United States, measures 52 by 62 feet. It boosts the Ranger's use of aluminum by 114 tons over that of her sister ships in the first class ever designed to carry airborne atomic Naval power.

The elevator, installed to shuttle jet planes between the hangar and flight decks, is fabricated of plate supplied by Alcoa. It saves an estimated 34 tons over a similar structure of high tensile steel.

Structural members for the vital elevator were either cold formed or cut to shape from aluminum plate ranging up to two inches in thickness. The hundreds of pieces required in the plate girder construction were welded by the inert gas shielded metal arc method to fabricate the elevator in two sections. Sections were then lowered into position aboard the Ranger and joined by welding.

ARC LENGTH . . . ARC VOLTAGE

(Continued from Page 56)

arc welding is a convenient tool to scale or measure arc length but it should be correlated with a specific wire feeding speed and current value. A new wire feeding speed will require a new voltage for the same arc length. A machine which produces constant arc length will also hold constant arc voltage so long as the wire speed does not change. When this factor is changed, however, (when correctly adjusted) the rising characteristic welder will shift up or down to the new voltage and hold it constant, all the while maintaining constant arc length. Thus, this makes possible truly automatic welding.

Arcrods Elects Vice Presidents

E. B. Lutes and L. G. Marini were elected vice presidents-engineering and-production, respectively, of Arcrods Corp., Sparrows Point, Md., it was announced by W. E. Brainard, president.

MEETS EVERY STANDARD ACROSS THE WORLD!

The leader for over forty years.
Quality in any quantity.

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PREVENT ACCIDENTS
CUT LABOR COSTS
EXTEND HOSE AND CABLE LIFE
EASY TO OPERATE
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"*Good things come in small packages.* Nowhere can we find a better description of this unique publication. INDUSTRY & WELDING is appealing because it has a direct approach to the subject matter, being confined to practical problems and their solution, and to applications.

The quality of authors is excellent, and their presentations are authoritative. A review of the advertising gives us an up-to-date cross-section of the latest in equipment.

Many of us today do not have the time available to read voluminous reports and articles and must depend upon a summary for the necessary information. INDUSTRY & WELDING makes a brief and concise presentation that can be read during available time. It is the *Readers' Digest* of the Welding Industry."

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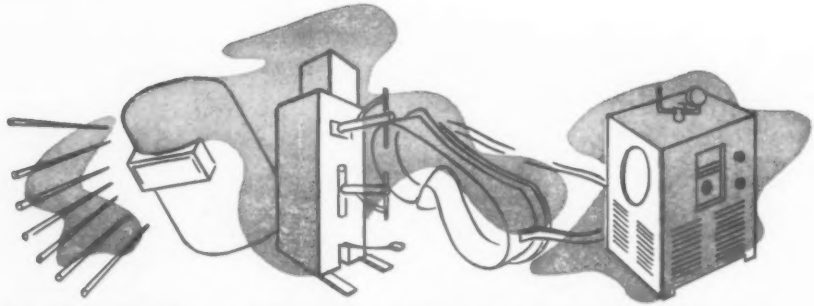


NEW PRODUCTS

Mobile X-Ray Unit

A new mobile X-ray machine that increases penetration of mobile X-ray from 4-inches of steel to 6-inches has been introduced by Holger Andreasen, Inc. Known as "Isovolt 400kV Mobile Constant Potential X-ray", it is equal

in capacity to one million volt X-ray machines. Supply voltages are 220 and 440, 60 cycles. Machine can be mounted on a trailer for transport in plant or field work. "Isovolt" is also available in 300 kV capacity.

Circle No. 136 on Reader Service Card.

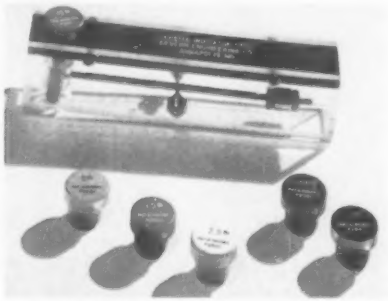
Welding Positioner

Designed for precise control of positioning complicated weldments, Model SA 40-P-1 introduced by The Weldma Company offers many advantages. Built to handle assemblies weighing up to 4000 lbs., unit provides smooth circumferential rotation and constant vibration-free power at exact predetermined speeds. Positioner use is said to result in cost savings because exacting control permits higher welding speeds and elimination of re-work.

Circle No. 137 on Reader Service Card.

FOR ADDITIONAL INFORMATION
Use Reader Service Card for additional information on the products appearing on this and the following pages, mark the key number of the item on the card bound into this issue. Drop the card in the mail—no postage required.

Ferrite Indicator



Designed for laboratory, shop and field use, rugged indicator for non-destructive testing is simple to use. It permits instant acceptance testing of austenitic stainless and manganese weld and base metals. Unit requires no external standards, no adjustments or visual readings and is unaffected by position, according to Severn Engineering Co., Inc.

Indicator is said to perform equally well on sheets, plates, rods, irregularly shaped objects and individual parts. It is claimed to be effective in locating areas of high and low ferrite content. The indicator covers all practical welding requirements; inserts available from 1.5 to 15 percent ferrite.

Unit weighs 3 ounces and is 5-inches long.

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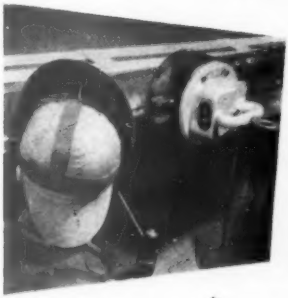
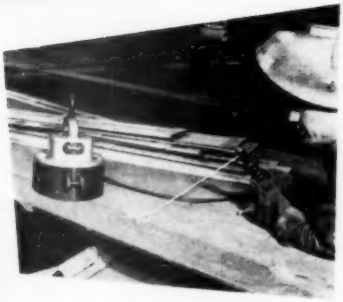
save up to 50 minutes on 30′ welds

with BUX magnetic plate clamps





ask your Bux dealer for a money-saving demonstration

You eliminate costly welding set-up time when you secure work pieces with efficient Bux magnetic plate clamps. No more clumsy, time-wasting clips, wedges or weights. Up to 6500 pounds of powerful electro magnetic pull positions and holds even heaviest plates while weld is made. Time saved in tacking, welding clamps and deburring cuts welding cost in half. Bux magnetic plate clamps are portable and rugged, can be used anywhere in the shop or field. Proven in thousands of uses in butt, lap, or warped plate welding—flat, vertical or curved pieces. Electro-magnetic power is controlled by positive action switch—flick on and full power is at work; flick off and magnet lets go instantly. There's no time wasting lag.

BUX

BUCK MFG. CO.
100 Roberts Road, Los Gatos, California

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WHY THIS TORCH SPEEDS WELDING 3 ways!

1. LIGHTER

. . . anodized aluminum handle . . . weighs ⅓ less . . . is easier to handle. Cuts welder fatigue.

2. STRONGER

. . . and more dependable! You get service-free production as it withstands abuse and rough handling.

3. COOLER

. . . the special stainless steel torch head is seven times less heat conductive than brass . . . cooler handles keep welders on the job!

4 MODELS A model for every welding and cutting need. Super-Jet, Aero-Jet, Star-Jet and Jet-O-Matic.

WRITE NOW for illustrated catalog.

MARQUETTE

MANUFACTURING COMPANY, INC.

307 E. Hennepin Ave., Minneapolis 14, Minn.

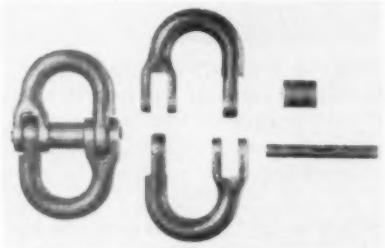
Dept. 6-121

Circle No. 51 on Reader Service Card.

New Coupling Link

A new coupling link that enables alloy chain users to make up their own sling and special assemblies has been introduced by Columbus McKinnon Chain Corp. Called "Hammerlok", link is said to eliminate time now required for ordering and shipping new or repaired assemblies direct from the supplier's factory.

Hammerlok link consists of a pair of body halves, a tubular stud and a hardened pin and can be assembled in seconds. Once assembled, it is securely locked by the steel pin which bites into steel stud. No peening or welding is required; link can be disassembled and re-used.



Circle No. 138 on Reader Service Card.

Stair-Climbing Hand Truck

A new stair climbing hand truck, which is said to double the load a man can roll up steps and treble the load he can move down stairs or ramps has been introduced by Valley Craft Products, Inc. The Stair Cart is equipped with a special ratchet mechanism which enables it to roll up stairs step by step as the operator pulls a cable drive.

Unit is equipped with two - wheel safety brakes and large pneumatic tires. Six different units are available, include a special barrel cart and a complete oxy-acetylene welding cart.

Circle No. 139 on Reader Service Card.

New Automatic Hard Surfacing Wires

A new and improved automatic and semi-automatic hard surfacing wire is said to make possible surfacing of worn parts with more ease and reliability. Called "Tube-Alloy," the copper-coated, alloy-filled wire, made by McKay Company, produces chemical uniform welds comparable in performance to that of solid wire.

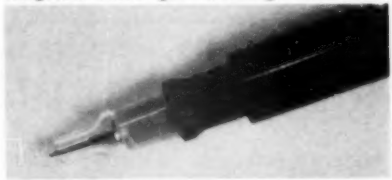
A McKay bulletin describing the new wire reports closer control of chemistry and hardness with trouble-free feed. Six grades of wire are available.

Circle No. 140 on Reader Service Card.

USE THE READER SERVICE CARD FOR VALUABLE REFERENCE DATA

Inert Arc Torches Now Have Rubber Skirt

To prevent "arching out," a rubber skirt has been added to water-cooled torches made by Tec Torch Co., Inc., for tungsten inert gas welding. The new safety feature is an integral part of the torch head and provides a sheath over the lip of the nozzle, thereby preventing high frequency arcing out. Improvement is made with no increase in torch price.



Circle No. 141 on Reader Service Card.

Aluminum Oxide Abrasive

A new abrasive produced by special new electric furnace process has been developed by Norton Company. Known as 44 Alundum, abrasive is a non-premium product which has proved to be economical to use in a wide variety of grinding operations. Its primary benefits are said to be greater toughness, higher inherent strength, finer crystal structure and greater sharpness.

Because of these advantages, grinding wheels made of 44 Alundum are said to last longer, hold form longer, and give better finish, faster and cooler cut and increased production.

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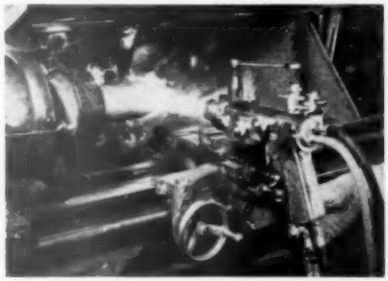
INDUSTRY & WELDING

812 HURON RD. CLEVELAND 15, OHIO

Metal Powder Spray Unit

A new metal spray unit of improved design for applying hardfacing alloys and other metals in powder form is now available from Wall Colmonoy Corp.



The new unit features improved metal flow rates and increased deposit efficiency.

Model C-2 Spraywelder components are mounted on a crackle-finished panel that may be either wall or pedestal mounted. Complete unit includes lightweight (3 lb.) aluminum pistol, chromium-plated hopper, carburetor, combination air regulator-filter and suitable oxygen, acetylene and powder hoses and fittings.

Improvements include redesigned carburetor and new spraying head design. Also featured is new combination air regulator-filter with clear-view plastic bowl.

Circle No. 143 on Reader Service Card.

Safety Caps, Hats

New fully resilient, Fiberglas-reinforced safety headgear manufactured by Welsh Mfg. Co., meet Federal Specification tests for impact, penetration, electrical resistance, flammability and water

absorption. Available in a wide range of colors, caps and hats have one size, suspension cradle that fits all head sizes and shapes comfortably.

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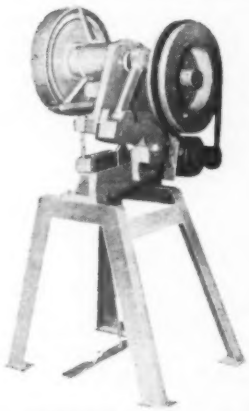
LOW-COST ANGLE & FLAT IRON CUTTER

BATEMAN POWER SHEAR



The only Power Shear of its kind on the Market today . . . now in 2 Models.

Model No. 2 (shown at left) cuts 2" x 2" x ¼" angles and 2" x ¼" flats. Has blades and punches for Ornamental iron, Channel 1", Squares ¾" and hand rail.

NO GRINDING NECESSARY AFTER CUT
ONE STROKE CYCLE CLUTCH OPERATES BY HAND OR FOOT
FLYWHEEL WITH GEAR DRIVE FOR POWER
TAKES ONLY 2' by 27" FLOOR SPACE

Bateman Power Shear Model No. 2, with punch, ¾ hp motor and stand $495.00
(FOB Mineral Wells, Texas)
Shipping weight: 645 lbs.

WRITE today for complete information and name of nearest distributor.

Bateman Foundry and Machine Co. **Mineral Wells, Texas**

Circle No. 17 on Reader Service Card.

Inside Automatic Welding

Inside longitudinal and circumferential automatic welding on cylinders too small to accommodate a standard welding head is said to be easy with a new fixture with special weld head introduced by Perry Anderson Co.

Head is part of a complete package

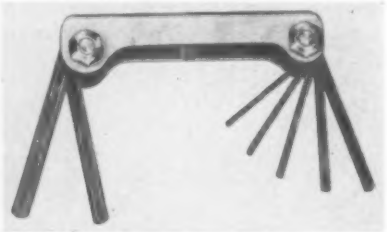
with power source for all automatic welding jobs. Boom will travel seven feet both vertically and horizontally, and has a speed from three to 50 ipm with 360 rotation.

All operating is done from single control at end of flexible cable.

Circle No. 145 on Reader Service Card.

Combination Hex Wrench Tool

Each of the seven different sizes of hex wrenches contained in this one-piece pocket tool may be used in a



straight position, 90° angle position or at an intervening angle. Sturdy springs keep wrenches not in use firmly in position in handle. Wrenches are made of chrome-nickel alloy steel and are hardened and tempered.

Manufacturer is Eklind Tool Mfg. Co.

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USE THE READER SERVICE CARD FOR VALUABLE REFERENCE DATA

cut weld cleaning time by 85%

Throw away your cold chisel and whisk off weld spatter with a dry rag! Protect-O-Metal spatter-proofing compounds make weld cleaning a breeze. Improve your welds at the same time . . . P-O-M compounds quiet the arc, improve fusion and electrode operation, prevent oxidation and annealing scale, cause no porosity. No smoke, odors, or fumes.

P-O-M No. 2. Non-inflammable, non-toxic, water-soluble paste. Inorganic. Thin before applying and start welding at once. $3.30 per gallon, f.o.b. Dayton.

P-O-M No. 8 Rust- and corrosion-resistant resin base compound. Comes ready to use. Safe for all metals. Good paint primer; permits outdoor storage of sub-assemblies. $3.35 per gallon, f.o.b. Dayton.

MONEY-BACK TRIAL OFFER
Order a trial gallon of each today for testing in your shop. We'll cancel the bill if you're not satisfied.

PROTECT-O-METAL

G. W. SMITH & SONS, INC.
5402 KEMP ROAD, DAYTON, O.

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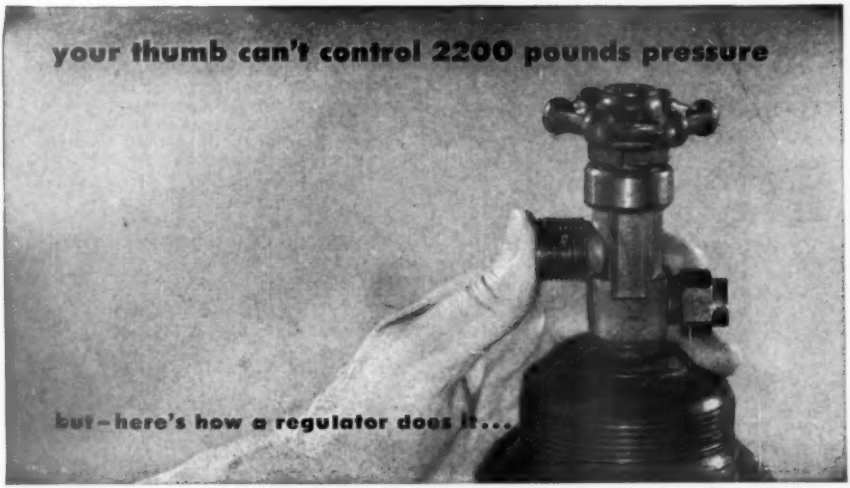

here are some of the interesting questions this book answers about regulators

How do regulators work — what is the difference between a single and a two stage reduction regulator — how does a gauge differ from a flowmeter—why are some regulators hard to adjust—what is a line regulator — what modern safety protection should a good regulator possess — what does the regulator inlet filter do — are big springs and large diameter diaphragms an advantage — how should one order a regulator

this brand new book, 44 pages and with twenty-five beautiful illustrations, is yours for the asking — it's free

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518 H

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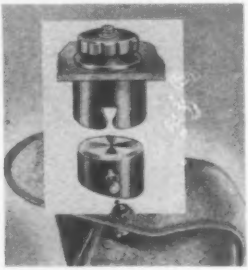
Connect-Disconnect Unit

Quick-Lok is a mechanical-type attachment introduced by Fibre-Metal Products Co. to make complete safety



units of welding helmets and safety caps. It is of compact design to avoid tension or spreading of the helmet shell. Only the small friction adjusting knob, operated even by a gloved hand, is on the outside of the helmet shell to offer smallest possible exterior projection.

Quick-Lok is supplied either as part of the welding helmet-safety cap combination or in kit form for conversion of "in stock" or field equipment.

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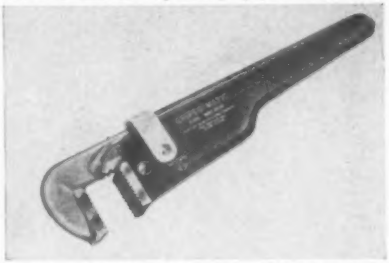
Lightweight Pipe Wrench

A new automatic lightweight pipe wrench has been introduced by H. R. Basford Co. The Gripso-matic is guaranteed to meet Federal strength specifications for heavy duty pipe wrenches,



yet is said to be 40 percent lighter than comparable size wrenches.

Unit features automatic saddle-type release for slide action adjustment to pipe size. Slender design is said to facilitate easier operation in tight places.

Handle is made of heavy gauge high-tensile steel; jaws and teeth are of forged steel, machined and heat-treated to prevent distortion and breakage.

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FROM PARTS
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KNOW!
NEVER LETS GO
BULL DOG Equipment!
AXLES — Any width — BULL DOG Straight or drop axles in single or tandem — capacities up to 10,000 lbs. and the famous BULL DOG safety engineered "Torq-Less" axles for all types of trailers.
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BULL DOG screw type jacks — with removable casters; with 6" steel wheels; with hard rubber wheels. BULL DOG gear type jacks — with non-removable caster; with disc foot; with 6" steel wheel; with hard rubber wheels.
COUPLERS
Trailer jack and coupler combinations; many models for 2500 to 10,000 lbs. capacity; other models for 12,000 and 20,000 lbs. capacity.
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MUREX

SPEEDEX-R

ELECTRODE

(iron powder similar to E-6010 type)

. . . in ANY weld position a fast, high-quality deposit

SPEEDEX-R is an iron powder version of the popular Murex Type R electrode. An outstandingly easy rod to handle in every position, it has a stable, spray-type arc with little spatter loss. Deposit is fast to lay and easy to control, because it wets and spreads readily, freezes quickly. Slag is thin, glassy and easily removed even in confined areas. Welds have shallow-rippled, smooth surfaces when made with normal arc length and the usual welding techniques.

SPEEDEX-R electrodes offer the speed of iron powder electrodes in all positions for welds requiring high tensile strength, excellent ductility and freedom from porosity. They help to shorten production schedules and cut welding costs, and provide weldments with physical properties well above minimum requirements.

SPEEDEX-R *Applications:*

- Pipe lines, pressure pipe
- Pressure vessels (fired and unfired)
- Tanks
- Low-alloy, high tensile steels, ¼" or less
- Steel casting repairs
- Plain or galvanized surfaces
- Field construction
- Machinery parts
- Shipyard applications

Give SPEEDEX-R electrodes a try and see the results for yourself. For further information on how they may be applied to your specific problem, please write.

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METAL & THERMIT
CORPORATION

GENERAL OFFICES: RAHWAY, NEW JERSEY

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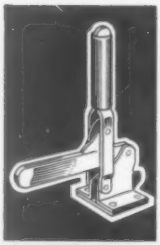
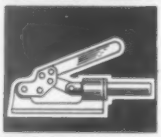
WESPO

TOGGLE CLAMPS





Hardened steel bushings and pins provide for longer wear — eliminate elongated holes and pin shearing.

A CLAMP FOR EVERY WORK HOLDING NEED

39 Sizes Available

WESPO TOGGLE CLAMPS are engineered and constructed for positive holding and light, medium and heavy clamping.

West Point Mfg. Co.
26941 W. SEVEN MILE RD.
DETROIT 19, MICHIGAN

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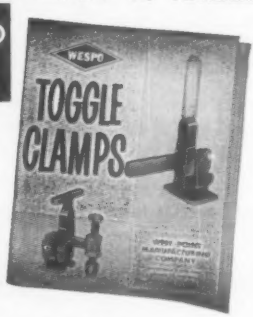
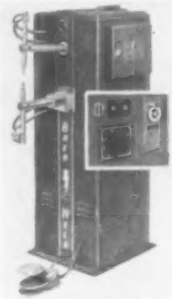


Circle No. 83 on Reader Service Card.

Automatic Spot Welder

A fully automatic air-operated spot welder which welds two pieces of ⅛-inch steel is now available. Produced by Brennen, Bucci & Weber, Inc., Bren-Weld SP-100 welds 18 gauge steel 100 spots per minute. First spot welder of its type to feature a transoidal transformer, this welder has a power factor of 70 percent. (Average stamped lamination-type transformer has a 20 to 35 percent power factor, according to the manufacturer.)



Fully automatic welder features repeat, non-beat operation; NEMA-type 1AX timer; welded structural steel frame in heavy gauge steel case; air cylinder with adjustable speed control in both directions; welding horns which can be moved in and out and rotated for maximum versatility. Controls are mounted on a single side panel for convenience. Self-compensating pressure switch eliminates need for adjustments when air pressure is changed.

Unit has radial windings for maximum ventilation and long unit life. Its primary windings are insulated with double glass over Formvar.

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Immediately Available . . . . at SPECIAL PRICES

ARC WELDING ELECTRODES

24,000 lbs. 5/32" Lincoln "Softweld" HIGH NICKEL CONTENT
(For machinable welds on cast iron)
In Export—Waterproof Packaging

ALSO LARGE QUANTITIES OF . . .

- 5/32" Abrasoweld
- 3/16" Wearweld
- 1/8" Ferroweld
- 1/8" & 5/32" Aerisweld
- 1/8" & 5/32" Aluminweld
- 1/8" Toolweld

Contact Us Immediately Your Best Offer

INDUSTRIAL AIR PRODUCTS CO.
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PORTLAND, OREGON

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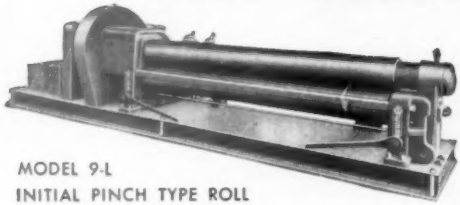
WEBB PLATE FABRICATING MACHINERY

PLATE BENDING ROLLS

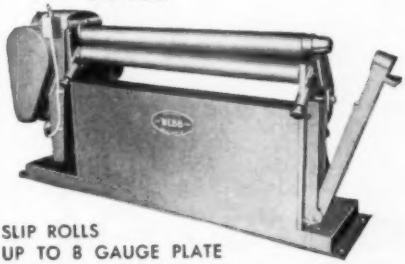


MODEL 9-L
INITIAL PINCH TYPE ROLL

Two types available: the Initial Pinch Type and Pyramid Type machines. All latest advantages of today's modern machine tools are incorporated, utilizing anti-friction bearings, totally enclosed gear drives. Special forming rolls for culvert pipe, stock tanks and other special shapes available.

SLIP ROLLS

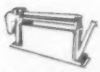
A complete line of small Sheet Metal Forming Rolls are also available. All power-driven with shaft sizes 3" to 5" for the handling of the thinnest gauge material, up to 8 gauge material. Special rolls for the forming of polished sheets, aluminum and stainless steels can be furnished. Complete catalogues on any size machine furnished upon request; write Dept. C.



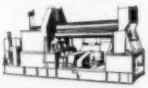
SLIP ROLLS
UP TO 8 GAUGE PLATE

The Webb Corporation offers a complete line of Plate Bending Rolls for the rolling of the thinnest plate up to plate 2½" thick. Offered in a variety of lengths and thicknesses. Constructed for the modern fabricating shop.

Let Speed PAY-The WEBB Way!



SLIP ROLLS



PYRAMID TYPE ROLL

INITIAL TYPE ROLL

STEELWORKERS

Also Manufacturers of INDUSTRIAL WEIGHING EQUIPMENT

Since 1881 **THE WEBB® CORP.**

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PROTECT COSTLY ELECTRODES

Low Hydrogen, Low Hydrogen Powdered Iron, Stainless Steel Electrodes, and Inert Arc Coiled Welding Wire are all feverishly thirsty, and adsorb atmospheric moisture immediately upon exposure. Weld metal porosity and other defects are an immediate and positive result. You can give these expensive electrodes the finest protection with Archer Aridair Stabilizers, especially engineered to stabilize the moisture content at the proper point. New 550# capacity Model 724SEA, equipped with twin chemical dehydrators and thermostatic control from 150° to 550° available immediately. Spare parts for discontinued Model 400 available.

FRED C. ARCHER, INC.

3723 N. Oakland Avenue,
Milwaukee 11, Wis.

High Nickel Brazing Alloys

A series of four high-nickel content brazing alloys for high temperature and corrosion-resistant service have been introduced by Handy & Harman. Called Handy Hi-Temp alloys, alloys are particularly useful for brazing austenitic stainless steel, high-nickel heat-resistant and precipitation-hardening alloys. They will also braze carbon steel and nonferrous metals having melting points above 1850°F.

The four high-nickel alloys have nickel contents ranging from 72.5° to 93.25 percent, silicon between 3.50 and 5.00 percent, and boron between 1.90 and 3.50 percent. Their designations as Handy Hi-Temp 93, 91, 82 and 72 are based on their approximate nickel content. The alloys numbered 82 and 72 have in addition a chromium content of 7.00 and 15.00 percent respectively. Handy Hi-Temp No. 93 and 91 both meet AMS specification 4778, No. 82 meets AMS 4777, and No. 72 meets AMS 4775. All the alloys are available as cast rod, powder, resin-bonded sheet, as well as in forms fabricated and sintered from the powder.

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For Valuable Reference Material
Available At No Charge
See Page 32.

BRITE-LINE REFLECTIVE MARKING KIT OVERWHELMS NATION'S STEEL FABRICATORS

OCT. 5 — Introduced the Brite-Line Reflective Marking Kit to fabricators in an *Industry And Welding* advertisement. Ad reported why Brite-Line was 100 times brighter than soapstone for metal layouts.

NOV. 1 — Nearly every blue chip aircraft plant and shipyard has ordered 2, 3 or more kits. Also, great response from all segments of metal-working industry.

TODAY — Nearly complete U.S. and Canadian distribution. Write for your nearest B-L supplier.

BRITE-LINE CORP.
3387 Brownlow Ave.
Minneapolis 26, Minnesota

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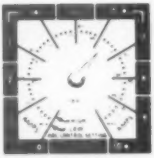
...for those tough "HARD to WELD" jobs *

VICKERS Controlarc* DC Welder

Right at your fingertips—exact control—compact, light weight for truly versatile performance

SELECTION OF ARC TYPE to suit your individuality and the welding job.



DUAL CONTINUOUS CONTROL in a rectifier welder. Can vary the current and the type of arc, with continuous stepless self-indicating dials.

*TRADEMARK

Gives You REMOTE CONTROL of Current and Type of Arc

Even in cramped places, this little remote control box goes right with you. You can "dial" the exact arc you need for any welding position, without running back to the welder to change range switches and taps. Only the Vickers CONTROLARC gives you this individual control of current and type of arc in convenient remote control operation.

AND ONLY THE CONTROLARC GIVES YOU THESE EXCLUSIVE OPTIONAL FEATURES:

- Constant Potential (CP) Adaptor
- Slope Controller

WRITE TODAY for more information on this versatile welder.

DESIGN ENGINEERS:
There are openings in our expanding program. Write for details.

VICKERS ELECTRIC DIVISION

VICKERS INCORPORATED a unit of Sperry Rand Corporation
1855 LOCUST STREET • SAINT LOUIS 3, MISSOURI

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Highlights of

George E. Linnert, head of welding research at Armco Steel Corp. Laboratories, presented Adams Honor Lecture on welding of precipitation hardening stainless steels.

MANY new welding developments for industry were revealed at the National Fall Meeting of the American Welding Society held in Cleveland on October 8-12. Over 1150 welding men attended the meeting to hear over 60 papers on advances in welding, brazing, cutting and metallizing.

A new process called motor arc welding that shows promise for fabrication of atomic power plant equipment was described in a paper by C. C. Stone and R. A. Noland of the Argonne National Laboratory. The new method produces smooth and sound circular welds in austenitic stainless steels, zirconium and aluminum. The process operates within a closed chamber and uses a point arc which is moved around a closed

Charles B. Smith, chairman of Los Angeles Section (left), receives two major membership awards from **Lew Gilbert,** 1955-56 national membership chairman (center). **John J. Chyle,** A.W.S. president, looks on.

Discussing membership are (left to right) **LaMotte Grover,** Airco; **Frank Mooney,** A.W.S. assistant secretary-treasurer, and **A. E. Pearson,** new national membership chairman. Other men are not identified.

# of A.W.S. National Fall Meeting

path between parallel arcing surfaces by means of an auxiliary magnetic field. An electrode shaped to conform with the weld geometry is employed.

A number of new improvements in the techniques and use of inert-gas-shielded metal-arc welding were also reported. K. E. Richter and J. F. M. Essig, Linde Air Products Co. said that the use of welding wires with diameters less than $\frac{1}{16}$ in. is now practical for joining light-gage aluminum, carbon and stainless steels.

A paper by J. W. Kehoe and H. J. Bichsel, Westinghouse Electric Corp., described recent advances in inert-gas metal-arc spot welding. By modifying standard inert-

A. F. "Charlie" Davis, Lincoln Electric Co. V.P. (left), shakes hands with **President Chyle** (center). Looking on are **Mrs. Chyle** and **C. P. Sander,** first vice president of A.W.S.

Left to right are **J. E. Dato,** (Linde) national convention chairman; **J. H. Humberstone,** (Airco) past national president, and **Mrs. Humberstone; John J. Chyle** (A. O. Smith), and **Mrs. Chyle.**

Greeting guests were **Tom Dempsey,** Cleveland arrangements chairman (right); **G. O. Hoglund,** (Alcoa) A.W.S. second vice president, looks on.

Not discussing welding were **Mr. and Mrs. Humberstone** (left) and **Mr. and Mrs. Miller** of Miller Electric Mfg. Co.

Heading shop management session were **Chairman Lew Gilbert,** executive editor of INDUSTRY & WELDING and WELDING ILLUSTRATED Magazines (right), and **Co-Chairman L. S. Cawrse,** president of Consolidated Iron-Steel Mfg. Co., Cleveland, Ohio.

Speakers in shop management session included (left to right) **H. B. Cary,** Marion Power Shovel Co.; **W. B. Bunn,** Combustion Engineering, Inc.; and **J. L. Fortunato,** Alloy Fabricator Division, Continental Copper and Steel Industries.

gas arc welding equipment, controlled-time arc spots can be obtained. These spots can be in the form of plug welds, fillet welds, inside and outside corner welds and butt welds.

George E. Linnert, head of welding research at the Armco Steel

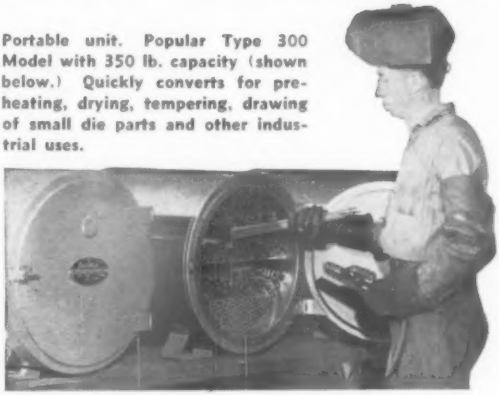
Protect Weld Rods The "DRY-ROD"® Way

Your cheapest insurance against wasteful, defective welds is Dry-Rod. Protects low-hydrogen, austenetic, other special alloy electrodes, and the new iron powder contact rods, against moisture.

DryRod promotes steadier welding with less slowdown — reworks — scrap. Pays for itself out of rod salvage alone. Less than 15c per 24-hour operating cost.

Completely wired, ready for use. Automatically controlled temperatures adjust from 175° to 550°. F. for storage or rebaking.

Two sizes available. 10 lb. capacity Portable unit. Popular Type 300 Model with 350 lb. capacity (shown below.) Quickly converts for preheating, drying, tempering, drawing of small die parts and other industrial uses.



For details, see your Welding Supply Dealer or write:

DR-23

Dry® Rod Div. of Phoenix Products Co.

4715 N. 27th St., Milwaukee 9, Wis.

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Corporation Laboratories, presented the Adams Honor Lecture. His paper covered the timely subject, "The Welding of Precipitation Hardening Stainless Steels." This honor lectureship is awarded annually to an outstanding scientist or engineer who has made a new or distinctive development in the field of welding.

Clarence E. Jackson, research metallurgist, Metals Research Laboratories of Linde Air Products Company, was presented the Samuel Wylie Miller Memorial Medal for researches in the field of welding metallurgy that have contributed significantly to the art of welding.

H. C. Ludwig, research engineer, Westinghouse Research Laboratory, was awarded the J. F. Lincoln Gold Medal for the paper judged as the most original contribution to the advancement and use of welding and published in *"The Welding Journal."* His winning article, "Nitrogen Effects in Argon-Arc Welding Atmosphere," was published in the September, 1955, issue.

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Now—Braze Stainless Steel with New Brazing Paste and Gas Torch

Every shop can braze stainless steel with new Nicrobraz Paste and standard oxy-acetylene equipment. A nickel brazing alloy combined with a new protective flux, Nicrobraz Paste doesn't require furnace brazing.

To learn more about this easy-to-apply, easy-to-fuse material, write and ask for more information.

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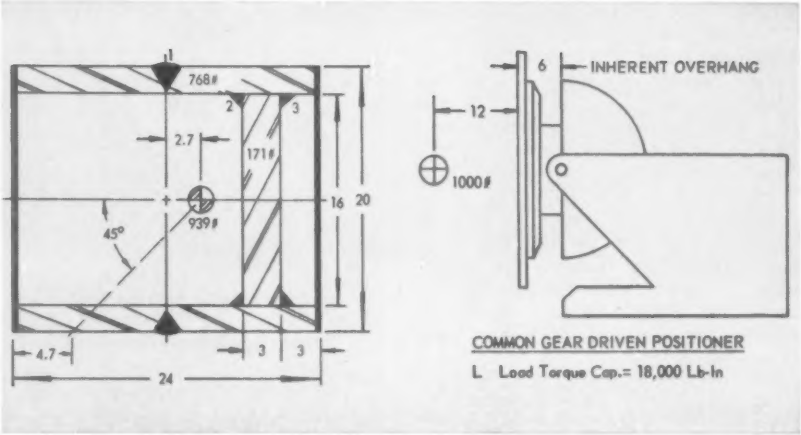

POSITIONEERING

PART 7

Positioning Data Sheets

by **CHARLES N. ARONSON, President**
Aronson Machine Company

WE can go no further with this Data Sheet without having a certain style positioner in mind for the job. We have enough information now to know that there are some styles of positioners that would not handle this weldment. And some that will.

In order to become familiar with Data Sheets, we must now draw on our past experience and knowledge of positioners. Anyone reading this far in this training course has had experience and knows about the Common Gear Drive Positioner. After we have gone through the sections dealing with types of positioners, we will come back to this same weldment and do another Data Sheet on it. In fact, a Data Sheet for any one job can be made for each type and size positioner under consideration, making final selection surer and easier.

When we marked in *198* for the weight of the Fixture (INDUSTRY & WELDING for November, 1956), we acknowledged the use of a Common Gear Driven Positioner for this job, because that is what the fixture was designed for. Naturally, until we have an idea what type positioner we will use, we can't design the fixture and know what it weighs. So, in actual practice, data on the fixture will have to remain in doubt until we

How to Use Positioning Data Sheets

POSITIONEERING DATA SHEET By:_____ Date:_____

User's Name and Address:_____ Model _____

WELDMENT WEIGHT:_____ Lbs. (Estimated?) (From Drawing?) (Computed?) (Actual Scale Weight?)
FIXTURE WEIGHT:_____ Lbs. It raises weldment_____"; its CG is_____" high and ____" off-center.

WELDMENT SHAPE IS: Angular____, Circular____, Cylindrical____, Regular____, Irregular____.
Sketch showing:
Diameter_____"
Length_____"
Height_____"
Width_____"
How mounted.
Will weldors be on weldment?_____
Where's the CG?
Estimated?_____
Computed?_____
Floor Trial?_____

TILT Load Torque: Weldment____ #" Fixture____ #" TOTAL____ #" (Positioner Capacity____ #")
ROTATION " ": Weldment____ #" Fixture____ #" TOTAL____ #" (Positioner Capacity____ #")
ELEVATION Load #: Weldment____ #" Fixture____ #" TOTAL____ #" (Positioner Capacity____ #")

WELD is_____(Manual)___Mechanical___Automatic___Intermittent___Continuous___)

WELD SPEED: Presently____IPM. Future anticipated is Maximum _____IPM, Minimum _____IPM.

Largest Weld Circle Diameter____" (Circumference____"). Smallest Diameter____" (Circumference____")
_____(RPM) (IPM) Required for Smallest Weld Circle and Highest Weld Speed. (Positioner: _____)
_____(RPM) (IPM) Required for Largest Weld Circle and Lowest Weld Speed. (Positioner: _____)

WELD CURRENT IS Now____ Amps, Future Maximum___ Amps, Minimum___ Amps, High Frequency?_____.

HEAT: Does the arc play on the weldment long enough to raise the temperature a lot?_____
Is the weldment pre-heated?_____. To what temperature?_____°F.
Does the fixture provide air space between weldment and table?_____. How much space _____"
Positioner used indoors?_____. Expected air temperature range is____°F Maximum to____°F Minimum
Positioner used outdoors?____. Expected air temperature range is____°F Maximum to____°F Minimum

Would it improve the procedure to have a Hollow Spindle for passage of gases or hoses, or other rear access advantages?_____

DUTY CYCLE is: Average____(Positioner run 20 Hrs/Wk) Low____Hiigh____. Actual Hrs/Wk are____.

Is positioner for a Job Shop type application_____. Production Run Job_____. Does the shop have 1 2 3 shifts per day? How many_____days per week? How many pieces are expected to be run per hour_____, day_____, week_____. How many minutes will positioner be run to make each piece_____. Will the positioner be run to make each piece_____. Will the positioner make frequent starts and stops_____. How long will this specific application be used Will the positioner take on a similar job next

Remarks:

have made this preliminary selection.

Quite often, a new and better positioner is needed to do a job that has been done and is being done, and for which fixtures are in existence. Then we would try to use fixturing already available. This might affect our selection of the positioner. Or, for a new job we can estimate what the fixturing will be like and how much it will weigh, and so on.

The positioner we used in our example (INDUSTRY & WELDING for September, 1956) had a rating of 1000#CG@12" above table. Let's use the same positioner in this data sheet.

How Mounted?

This is why we couldn't go any further until we had made a preliminary selection of the positioner we were going to use. You are to indicate in your sketch just how the weldment is to be mounted. The sketch has end faces marked very heavy. That's one way.

Another way would be to mark in colored pencil. Other types of weldments will require other ways of showing which surface is toward the positioner, even simply writing in a notation. Right now we are so familiar with this weldment and the positioner we have selected that you may feel this item isn't important, but with some weldments and procedures it is extremely critical.

Let's resume filling in our Data Sheet.

Will operators be on weldment? No.

Performance of this job doesn't require it, so we say NO. If you want some extra exercise and a shock, too, when you're done with this Data Sheet, figure the effect of a 200 pound operator using the outermost end of the weldment as a step to get up on something.

Where's the CG? Estimated? Computed? 14.7" Floor Trial?

Your sketch must show where the CG is located and a mark made in one of the spaces provided to show how it was located. The fact that it was computed means we can be pretty sure it is right. Floor trial means you rocked the weldment back and forth until it balanced and located the CG that way. This is a fairly sure method, too. If the CG location was an estimate, the good positioner will make extra allowances to be safe in case the estimate was adversely inaccurate, which it often is.

Load Carrying Capacity

We must now determine if our selection will pass muster as regards load carrying capacity. If the positioner isn't big enough for the job, there's little to be gained by considering it any further. The next three lines of the Data Sheet prove our selection's load carrying capacity. But, before we can go into that we must have a selected positioner.

We have already decided to try to use the positioner shown in the sketch which shows a rating of 1000 lbs. with CG 12" out from table. If the 1000 lbs. is the maximum load capacity regardless of CG location, then we had better look for another positioner now, because our weldment weighs 939 lbs. and our fixture 198, a total of 1137 lbs.

However, it happens that this positioner is actually rated at 1500

you know, this **miller** *AEA-200-L is quite a deal*

The man's right of course, and here's why: As a welder, it provides a full 200 amperes of ac welding current . . . handles ac or ac-dc electrodes up to 3/16". As a power plant, the rotating field design generator—coupled to Onan CK engine—supplies 4500 watts of 110/220 current; or, 1000 watts of dc power while welding. Waterproof and light weight (435 lbs.), the AEA-200-L offers easy portability, all-weather operation and real versatility. Rubber-tired running gear and road trailer available. Model AEA-200, without auxiliary power, weighs 420 lbs. Larger engine driven units to 350 amperes with generator output of 10KW.

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APPLETON, WISCONSIN

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"Positioneering is the science of positioning a workpiece as a means of improving quality, increasing production and lowering manufacturing costs."

lbs. maximum load when the CG is within 6" of the table top surface, giving a Tilt Torque Load Capacity of 18,000 Lb-In because it has a 6" Inherent Overhang. 1500#/12" from fulcrum is 18,000#. At 12"CG location the rating is 1000# as shown, because 18" goes into 18,000#" 1000 times.

Limit to Capacity

Positioners of this kind are rated at maximum load gross weight because when the table is flat all the weight is taken in thrust by the top spindle bearing. When table is tilted the load is in effect a beam supported by both spindle bearings, this time as a radial load. More about this will be covered in a later section but we wanted to show that there is a limit to the gross weight capacity even when the CG is very, very close.

We need a Model Number for our chosen positioner so we can mark it in the space provided at the upper right corner of the Data Sheet. Let's take the underlined letters and numbers of the following: Common Gear Driven Positioner of 1500 lbs. capacity, and we have the Model Number CGDP-1500. Mark that in on your Data Sheet.

Need Manufacturer's Specs

Because this Model CGDP-1500 is make-believe for this first Data Sheet exercise, we do not have any Manufacturer's literature on it and no Positioner Specifications.

In actual practice, the positioneer should always have before him during Data Sheet work the Specification page relating to the positioner under consideration. Thorough comprehension of available literature and specifications are needed, but for our make-believe CGDP-1500 we will interpolate as we go along.

Tilt Load Torque: Weldment 19,437#.

Always figure the most severe conditions, as we have here. If the positioner has capacity for the worst condition, it has capacity for all conditions. Here we have used the weldment's greatest weight at the farthest CG location, the 14.7" we marked in the space after the word "Computed?". Adding the 6" Inherent Overhang gives us a 20.7" arm. The weight, 939#, times the arm equals the Weldment's Tilt Load Torque or 19,437#".

Fixture 2,297#"

This is 198# times 11.6" (5.6" plus 6") equals 2,297#". Again, the worst condition. In fact, if you recall what we found earlier, part of the fixture will not be in use when weldment is in the highest tilt load torque condition. But, for preliminary examinations we do not split hairs.

Total 21,734#"

Adding Weldment and Fixture Load Torques gives us Total Load Torque of 21,734 Lb-In.

(Positioner Capacity. 18,000#")

Now is the right time to erase the CGDP-1500 and the 18,000 and select the next size larger positioner in this type class. We are knowingly loading this machine to 120.7 percent. That's a known known 20.7% overload going into the job, before anybody has had a chance to hang extra parts on the weldment and/or fixture.

The operator hasn't had his

chance yet to use the open outer end of the weldment for a step to get up onto something.

This obviously isn't a one piece run-off job or they wouldn't have made a pretty fixture for it.

We can get by if we take into account that in this worst condition the tilt will be no more than 45°, making the actual Tilt Load Torque, 7071 of 21,734#", or 15,368#. That would mean that the complete success of this application depends on everybody remembering not to tilt beyond 45° when the set-up is for this operation. And experience tells us this is not a good risk.

Conclusion: Model CGDP-1500 will not serve our purpose and cannot be used.

Next Month: Secondary preliminary selection of welding positioners.

40th Anniversary for Southern Oxygen

Southern Oxygen Co., Washington, D.C., is celebrating its 40th business anniversary this year. With plant locations in Bladensburg, Md.; Kingsport, Tenn.;

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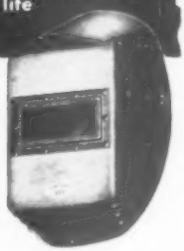

Angle-Shaped for Better Protection Easier Work "In Close"

Next time you need a new helmet ASK YOUR WELDING FOREMAN TO SPECIFY a HUNTSMAN face savers

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108-R North Water St., Milwaukee 2, Wis.

Circle No. 2 on Reader Service Card.

Greensboro, N.C.; and Vineland, N.J., firm has over 50 district offices and warehouses serving the southeastern states.

Celebrate Accreditation

Utilities Engineering Institute, Chicago, Illinois, has been accredited by the Accrediting Commission and Examining Committee of the National Home Study Council, standard-setting agency for private home study schools for 30 years. Accreditation means that each school accredited has met certain rigid requirements.

To celebrate its accreditation, the Institute recently held an Open House. Guests toured the Schools

classrooms and training shops, including welding facilities.

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Aluminized Clothing Withstands 1200° F Temperatures

COATED with a thin layer of aluminum, fabrics and other materials now can reflect radiant heat instead of insulating against it. This makes it possible for workers to work for several minutes at a time in temperatures up to 1200°F.

In a recent test a demonstrator wearing an aluminized suit six times entered an industrial furnace heated to 1200°F. He stayed for two or three minutes each time, as if on a repair or rescue mission. To show the intense heat from which he was protected, demonstrator walked into the oven carrying an armload of wood which burst into flames while he held them. He returned with a manikin wearing a fireman's rubber fire-fighting coat and another wearing ordinary street clothes, both of which burned while he was unaffected.

Demonstration was sponsored by Minnesota Mining and Manufacturing Co., developer of the coating process. Suit used is produced by Fyrepel Products, Inc. and has aluminum coating on a fibre glass material which is backed up with fibre glass quilting.

Other existing garments are pro-

duced from aluminum-coated light asbestos (1.2 pound herringbone) or aluminum-coated cotton. These require no insulation. Both cotton duck and light asbestos are equally heat-protective, but the asbestos also protects against molten splash.

Aluminum garments now being manufactured include fire-fighting coats, protective clothing for steel workers, quilted suits for use in industrial ovens and furnaces and other garments designed for specific "hot jobs" in specific industries.

For more information on this new development, write Editor, INDUSTRY & WELDING Magazine, 812 Huron Road, Cleveland 15, Ohio, or Circle No. 200 on Reader Service Card.

NCG Expands

A new hydrogen producing plant will be constructed in St. Paul by National Cylinder Gas Co., according to Charles J. Haines, president. At the same time, Mr. Haines announced that NCG would construct a new oxygen and nitrogen plant in Portsmouth, Va., and would expand its electrolytic hydrogen plant in Los Angeles.

Circle No. 16 on Reader Service Card.

WOOD HANDLE OR STEEL HANDLE—
Atlas Gives You The Best!

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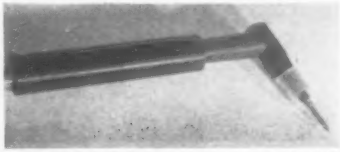
TIG WELDING
Made Easy With
"Visuweld" Torches



VISUWELD torches improve and simplify tig welding by giving faster and better welds with less effort and minimum torch maintenance.

- The lightest and smallest 300 amp TIG welding torch with super maneuverability.
- Only TIG torch made with standard size transparent nozzle that guarantees absolute welding visibility.
- No SPARE PARTS NECESSARY. No gaskets or parts to 'screw together'.
- VISUWELD contained unit torch head guarantees no water or gas leakeage, and the coolest TIG welding torch ever designed.

Perfect welds at welding ranges from 3 to 350 Amps eliminates the need for 'standby' torches. VISUWELD torches are 3 torches in 1.

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Carlstadt, N. J.

NEWS

from page 28

Airco Announces District Changes

A. S. Blodget, Jr., district manager for Air Reduction Sales Co. sales office in Pittsburgh has been appointed regional sales manager with offices in New York City, it was announced by H. F. Henriques, vice president. Sam S. Bruce, Jr., Chicago district manager, succeeds Mr. Blodget.

A. S. BLODGET

Also effective the same date, G. J. Dekker, district manager in Milwaukee was named to succeed Mr. Bruce in Chicago. It was also announced that the Chicago district has been expanded to include the Milwaukee area. C. F. Woelm, assistant sales manager, Milwaukee, has been made branch manager at that location.

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WELDERS SUPPLY COMPANY
806 Broadway
Rockford, Illinois

Circle No. 81 on Reader Service Card.

Welding & Cutting Supply Co. Celebrates 25th Anniversary

A unique and interesting announcement letter issued by Welding & Cutting Supply Co., Cleveland, Ohio, announces that the firm has just completed a quarter century of service in the welding field. The letter is amply illustrated by cartoons which depict important happenings of the past 25 years.

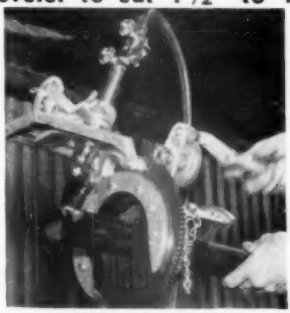
Headed by M. M. (Bud) Powar, the firm authenticates the circulation of WELDING ILLUSTRATED in Northeastern Ohio, paying for the magazine for its customers in that area.

New Brass Mill

Production of copper and copper alloys in the last quarter of 1956 by American Brass Company's $15,000,000 Los Angeles brass mill is predicted by C. Russell Epley, general manager of the company's Los Angeles Division. The new plant, which should be in capacity operation by April, 1957, will produce copper and copper base alloys in all forms. Annual capacity is estimated at 30,000,000 pounds.

Circle No. 39 on Reader Service Card.

H&M announces the MODEL "O" — a pipe Beveler to cut 1½" to 4"!



PATENT APPLIED FOR

PERFECT BEVELS — COMPLETELY PORTABLE!

(*Weight: 7½ lbs.*)

With the same split-gear horseshoe principle as H&M's larger models, the Model "O" offers the maximum in speed and quality of bevels on small diameter pipe! Rugged and dependable, H&M's Model "O" is easily operated by unskilled operators, and changing from one size pipe to another is a matter of seconds! Write immediately for fully illustrated brochure!

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- INCREASED TRACTION
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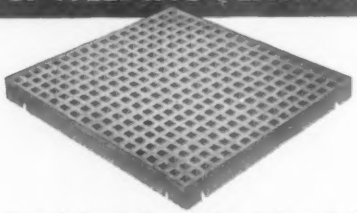

4 ft. x 4 ft.—5 ft. x 5 ft.—5 ft. x 6 ft. Also other sizes. Cast steel blocks for lay-out, welding and assembly. Tools, stands and accessories. Write today for information.

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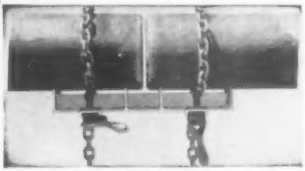

For fast, Accurate Pipe Welding. Sturdy construction for hard usage. Aligns and holds pipe for tacking. Two sizes: ½" to 8" and 8 to 16". Write for details

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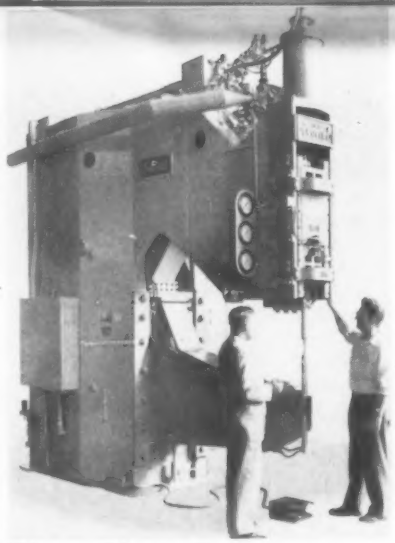

Three Phase Frequency Converter Spot Welder

Reaching over 13½-feet in the air and weighing over 58,000 lbs., the Federal Machine and Welder Company's three phase frequency converter spot welder is the largest machine of this type ever built. It is designed with a special throat of approximately 2100 square inches to accommodate a portion of the tail section of the largest commercial jet airliner under construction in this country.

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The most complete line of clamps. Stock sizes from ¾ in. to 12 ft. openings ½ in. to 16 in. deep.

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Mr. Fulton has been with the company for over 21 years. During that time he served as factory sales rep, district manager and new products engineer.

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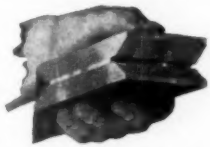

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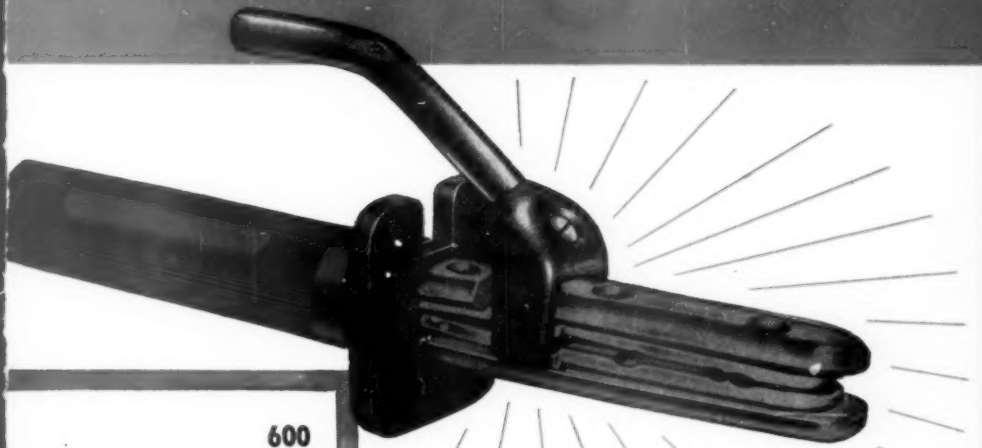

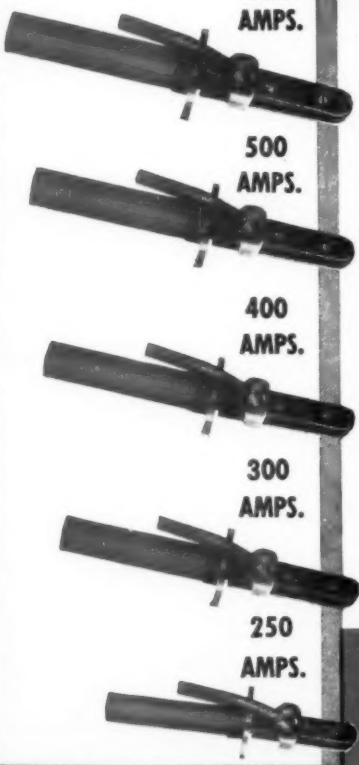

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